Opuscula Philolichenum

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Editor:
JAMES C. LENDEMER
Department of Botany
The Academy of Natural Sciences of Philadelphia
1900 Benjamin Franklin Pky., Philadelphia, PA, 19103, USA
e-mail: lendemer@acnatsci.org

Opuscula Philolichenum is published by the editor, and is not to be considered affiliated in any respect with The Academy of Natural Sciences of Philadelphia. This journal is intended to provide an outlet for the publication of short papers in lichenology, especially small floristic works, checklists, and modest taxonomic revisions. Unlike other similar journals that publish such works, nomenclatural/taxonomic acts are allowed. *Opuscula Philolichenum* was created, in part, as a response to the issue of electronic publication that is currently faced by the scientific community. While the editor does not advocate allowing nomenclatural changes to be made in fully electronic publications it seems illogical to ignore the possibilities of the technological advancements of the last century. While *Opuscula Philolichenum* is a printed publication (as required by the ICBN) the papers published within its pages are available free of charge in pdf. format on the editor's website (http://clade.acnatsci.org/lendemer/opus.html).

The editor's website has been indexed in several search engines and thus papers appearing in this journal are routinely found in search results for related topics. The dominance of technology (especially the internet) in our present-day society has drastically changed our lives and the field of lichenology. Though not all changes may be for the better, modern technology allows the exchange of information and ideas at an ever increasing rate. The editor hopes that this journal facilitates the exchange of ideas and collaboration not only within the field of lichenology but between lichenologists and other scientists, land managers, government agencies such as the National Park Service, and the general public. Although the subjects touched on in the papers included in this volume are quite varied, one will notice that a central theme has emerged: the collaboration between lichenologists and other scientists (ecologists, botanists, and others) to better understand the taxonomy of lichens and to place them into a broader habitat-based context.

The editor would like to take the to opportunity to thank those who graciously provided peer review of the papers published in this volume: I.M. Brodo, R. Dirig, S. Ekman, A. Fryday, R.C. Harris, K. Knudsen, S. LaGreca, D. Ladd, B. McCune, A.F. Rhoads, G. Thor, E. Timdal, C.M. Wetmore, and S. Werth.

Guide for submission:

Authors wishing to submit a manuscript for publication in *Opuscula Philolichenum* should contact the editor prior to submission to confirm that the paper conforms to the mission of the journal (outlined above). Manuscript submissions should be left unformatted and authors should consult a recent issue of *Opuscula Philolichenum* for style. All submissions are subjected to review by at least two peer reviewers and, following acceptance are formatted by the editor.

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The Genus *Myriospora*

RICHARD C. HARRIS[1] & KERRY KNUDSEN[2]

ABSTRACT. – *Myriospora* Nägeli *ex* Hue, previously placed in synonymy with *Acarospora* A. Massal., is considered to be distinct. The nomenclature of the generic name *Myriospora* and its type species are reviewed and both are lectotypified.

Lendemer & Harris (2004) casually proposed resurrecting *Myriospora* as a segregate from *Acarospora* A. Massal. for *Acarospora heppii* Nägeli ex Körb. and Harris (2004) transferred *Acarospora immersa* Fink ex J. Hedrick to *Myriospora*, blithely assuming that Zahlbruckner (Cat. lich. univ. 5: 51. 1927) was correct in attributing the place of publication to Hepp's exsiccate (Flecht. Eur. 57, 1853). When the nomenclature was reviewed for Knudsen's treatment for the Sonoran *Acarospora*, it was discovered that this was incorrect and that the nomenclatural situation was more complex.

Hue (1909) recognized *Myriospora* because it differed anatomically from *Acarospora* DC. in having emergent, lecanorine apothecia with lateral exciple only, similar to that found in *Pertusaria* DC. *Myriospora* is currently considered to contain two species: *M. heppii* (Nägeli ex Körb.) Hue. and *M. immersa* (Fink ex J. Hedrick) R.C. Harris. They are distinguished from *Acarospora* by the deep blue staining of the tholus in K/I (fig. 1). Unlike the majority of other species assigned to *Acarospora,* the genus has an epinecral layer instead of a syncortex. One other *Acarospora* is known to the second author to have a true epinecral layer, *A. nodulosa* (Duf.) Hue. *Myriospora* species appear to usually produce crystals in the true exciple, a character that needs further study. The value of pruina on the apothecial disk as a character separating *M. immersa* from *M. heppii* needs to be evaluated further.

Myriospora heppii first appeared as a *nomen nudum* in Hepp's *Systematische Sammlung* (1849-1852), an apparently rare exsiccate (fig. 2). Our nomenclatural treatment below is based on the available evidence which indicates that the first four fascicles of Hepp's *Flechten Europas* were published simultaneously. They are treated by Hepp (1853) in a single issue of the supplementary publication illustrating the ascospores, the four are uniformly dated to 1853 by all references seen and Nylander (1854) reviewed the four as a unit. Additionally, where more precise dates of publication are available for later fascicles (Lynge, 1916), it was Hepp's practice to issue several fascicles simultaneously, i.e., fasc. 5-7 (July 1857), fasc. 10-12 (Aug 1860), fasc. 13-16 (Apr 1867). In 1853 three species of *Myriospora* were included, *M. rufescens* (Borr.) Hepp [fasc. 1, no. 56], *M. heppii* Nägeli ex Hepp [fasc. 2, no. 57], *M. macrospora* Hepp [fasc. 2, no. 58]. There is no separate description of the genus *Myriospora*. The three names are not validly published (ICBN Art. 43). The compilers of *Index Genericorum*, apparently believing that fascicle 1 of the *Flechten Europas* antedated fascicle 2, considered *Myriospora* to be a monotypic genus with *M. rufescens* as the type species, in which case *Myriospora* would be validated as a combined generic/specific description (ICBN Art. 42). However, this applies only when a single species is involved and, assuming the first four fascicles were published simultaneously, this would not be the case here. If the *Index Genericorum* view were to be accepted, *Myriospora* would be a synonym of *Acarospora,* throwing out what seems to be a useful and appropriate generic name. We consider *Myriospora* not to have been validated until 1909.

[1] Richard C. Harris: Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458-5126, USA.
[2] Kerry Knudsen: Lichen Curator, Herbarium, Department of Botany & Plant Sciences, University of California, Riverside, CA 92521-0124, USA. - e-mail: kk999@msn.com

Myriospora heppii. - *Fig. 1.* Asci of *Myriospora heppii* after K/I treatment, from Hepp, Flecht. Eur. 57 (NY). *Fig. 2.* Hepp, Systematische Sammlung Tab. 13, no. 148.

Myriospora Nägeli ex Hue, Nouv. Arch. Mus. Hist. Nat. Paris 1: 164. 1909. Lectotype (designated here): *M. heppii* (Nägeli ex Körb.) Hue.

Myriospora when validated by Hue contained two species, *M. heppii* and *M. lapponica* (Ach. *ex* Schaer.) Hue. *Myriospora lapponica* is now placed in *Polysporina* Vězda and so to avoid making *Myriospora* a synonym of *Polysporina, M. heppii* is the logical choice of lectotype for the genus.

Myriospora heppii (Nägeli ex Körb.) Hue, Nouv. Arch. Mus. Hist. Nat. Paris 1: 164. 1909.

Myriospora heppii Nägeli ex Hepp, Systematische Sammlung der von Dr. Hepp im Kanton Zürich Tab. 13, no.148. n.d. *nom. nud.*, Flecht. Eur. fasc. 2, no. 57. 1853 *nom. inval.* (Art. 43).

Acarospora heppii Nägeli ex Körb., Parerga Lich. 61. 1865. TYPE: "Auf Kalkstein – Findlingen", *Hepp, Fletch. Eur. 57* (NY!, lectotype, **designated here**; NY!, isolectotype).

Körber cited two synonyms when publishing *Acarospora heppii*, "*Myriosporae* sp. Hepp Eur" and "*Gyalecta Acharii* Schaer. Enum. 93 pr. p. (teste Hepp)". He also cited an exsiccate specimen "Hepp Eur. 57". Given the previous uses of Nägeli's name, although these are invalid, it seems logical to choose Hepp, Flecht. Eur. 57 as the lectotype collection.

ACKNOWLEDGEMENTS

We are indebted to the curator of ZT for providing the image of Hepp's *Systematiche Sammulung*.

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Occurrence and Abundance of Epiphytic Cyanolichens in Protected Areas of Nova Scotia, Canada

ROBERT P. CAMERON[1] & DAVID H.S. RICHARDSON[2]

ABSTRACT. – Epiphytic cyanolichens occurrence and abundance was recorded in thirteen Wilderness Areas and one Nature Reserve in Nova Scotia, Canada. Twenty-one species were found. Very common species include those in the genus *Lobaria*, as well as *Collema subflaccidum*, *Leptogium cyanescens* and *Parmeliella triptophylla*. Uncommon species include *Collema furfuraceum, Collema nigrescens, Nephroma bellum* and *Pseudocyphellaria crocata.* Rare species are *Coccocarpia palmicola, Degelia plumbea, Erioderma pedicellatum, Leptogium corticola, Leptogium laceroides, Leptogium saturninum, Nephroma laevigatum, Nephroma helveticum, Pannaria conoplea, Pseudocyphellaria perpetua* and *Sticta fuliginosa*.

INTRODUCTION

Cyanolichens are lichens in which cyanobacteria are one of the symbiotic partners. For some species of lichen, like those of the genus *Collema* or *Leptogium*, the cyanobacteria are the photosynthesizing partner. In other species, like *Peltigera apothosa* and *Lobaria pulmonaria*, algae are the primary photosynthesizing partner with cyanobacteria occurring in delimited areas called cepholodia. In all cases cyanobacteria can fix atmospheric nitrogen.

Only about 10% of lichen species worldwide, are cyanolichens but cyanolichens can be locally abundant in certain habitats such as mature, old growth or sub-oceanic forests (Nash 1996). Indeed, cyanolichen abundance can sometimes exceed that of other green algal lichens as in the cedar-hemlock forest of British Columbia (Campbell and Fredeen 2004). In the humid coastal forests of Nova Scotia cyanolichens make up a significant component of the lichen diversity (Selva 1999, Seaward et al. 1997, Casselman and Hill 1995).

Cyanolichens have been shown to contribute significant amounts of nitrogen to ecosystems in Sweden (Huss-Danell 1977, Kallio 1974), North Carolina (Becker et al. 1977, Becker 1980), Columbia (Forman 1975), Chile (Godoy et al. 2001) and British Columbia (Campbell and Fredeen 2004).

Cyanolichens, particularly epiphytic cyanolichens, are sensitive to acidifying air pollution (Gries 1996). The decline in the cyanolichen *Lobarion* community in Europe provides some of the most compelling evidence of the effect of air pollution (Wirth 1988). Studies have continued to document declines in cyanolichens (Hallingbäck 1989, Richardson 1992, Krivorotov 1998). The loss of the boreal felt lichen (*Erioderma pedicellatum*) from New Brunswick and Europe and a 90% decline in Nova Scotia has been attributed to pollution, particularly acid rain and to habitat destruction (Maass and Yetman 2002). Habitat destruction is largely due to forestry practices (Maass and Yetman 2002). Particular forestry practices have been shown to be detrimental to cyanolichens (Richardson and Cameron 2004) and even forestry practices aimed at maintaining rare cyanolichens have had limited success (Pykälä 2004).

The Atlantic population of the boreal felt lichen has been listed as endangered and the Nova Scotia Department of Natural Resources initiated a process to assess the populations of all cyanolichens in Nova Scotia. A team of experts was assembled but it was quickly realized that very little was known about the status of cyanolichens in Nova Scotia. This study documents occurrence and abundance of epiphytic cyanolichens in Nova Scotian protected areas. This will aid in status assessment, conservation planning and long-term monitoring.

[1] Robert P. Cameron: Nova Scotia Department of Environment and Labour Protected Areas Branch. 902-424-2176, facsimile 902-424-0501. - cameroprp@gov.ns.ca.
[2] David H. S. Richardson: Faculty of Science, Saint Mary's University. 902-420-5493. - david.richardson@smu.ca

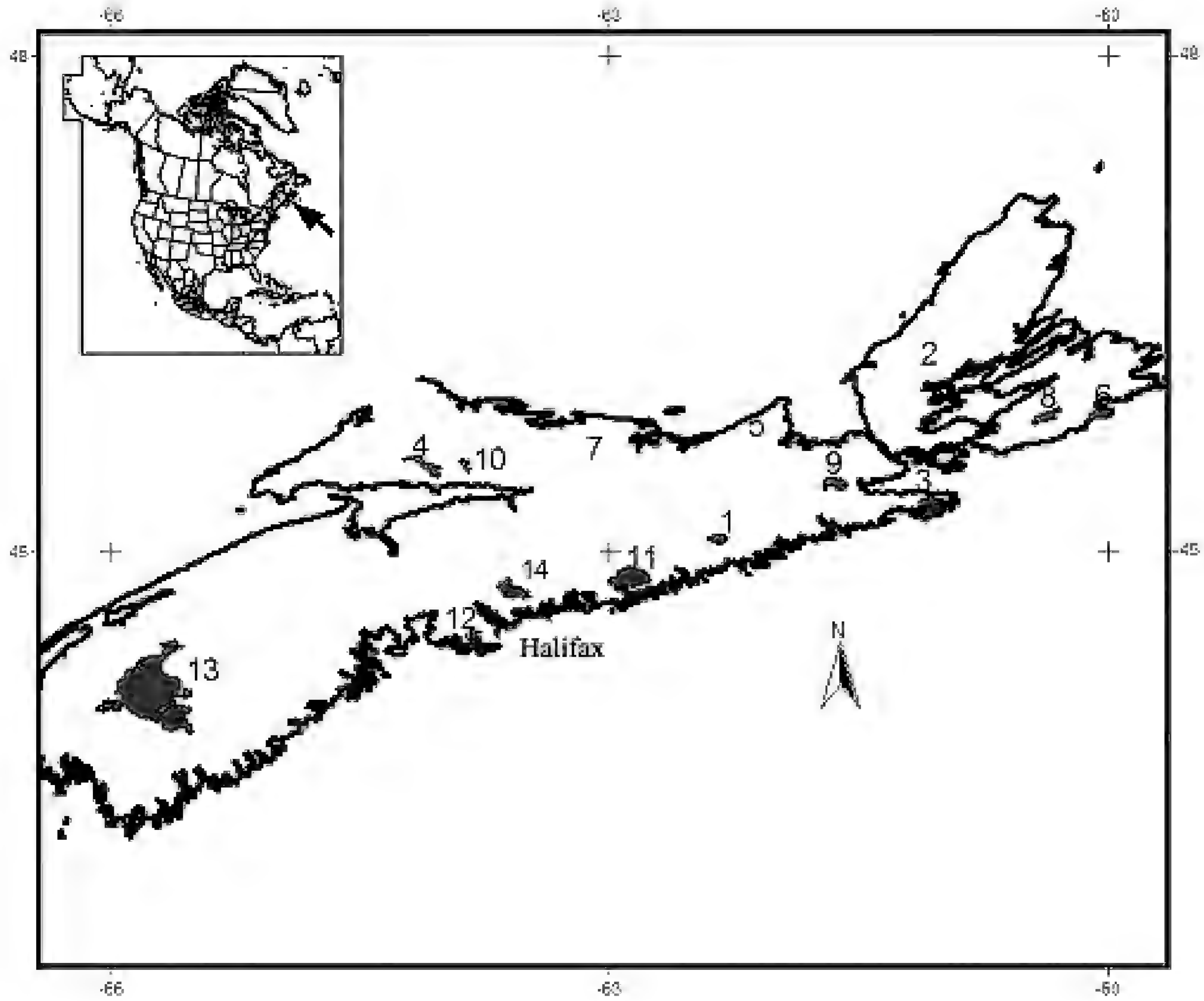

Figure 1. Nova Scotia protected areas surveyed for presence and abundance of cyanolichens: **1**=Boggy Lake Wilderness Area; **2**= Bornish Hills Nature Reserve; **3**=Canso Coastal Barrens Wilderness Area; **4**=Economy River Wilderness Area; **5**=Eigg Mountain Wilderness Area; **6**=Gabarus Wilderness Area; **7**=Gully Lake Wilderness Area; **8**=Middle River Framboise Wilderness Area; **9**=Ogden Round Lake Wilderness Area; **10**=Portapique River Wilderness Area; **11**=Tangier Grand Lake Wilderness Area; **12**=Terence Bay Wilderness Area; **13**=Tobeatic Wilderness Area; **14**=Waverley Salmon River Long Lake Wilderness Area.

STUDY SITES

Fourteen protected areas were selected for study, including thirteen Wilderness Areas and one Nature Reserve (see above figure and Table 1). The selection was stratified to include study sites across the province. Western Cape Breton Island was not included in the surveys because of the extensive lichen sampling done in protected areas there by Selva (1999). Southwestern Nova Scotia was under represented in this study because of time constraints.

Nova Scotia has a temperate maritime climate and is dominated by forests. Annual precipitation ranges from 1200 to 1600 mm with a mean annual temperature of 6ºC (Davis and Browne 1998). Forests are made up of tree species typical of the Acadian Forest Region and include deciduous forests of sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*) and American beech (*Fagus grandifolia*), well as coniferous forests of red and black spruce (*Picea rubens* and *P. mariana*), balsam fir (*Abies balsamea*), pine (*Pinus spp.*) and hemlock (*Tsuga canadensis*) (Farrar 1995).

Table 1. Protected Areas surveyed for presence and abundance of epiphytic cyanolichens in Nova Scotia. From Cameron (2004). WA = Wilderness Area, NR = Nature Reserve.

Protected Area	Size (ha)	Number of Locations Surveys Occurred	Dominant Forest Type	Climate Region*
Boggy Lake WA	3700	1	shade-tolerant deciduous and coniferous	eastern
Bornish Hills NR	1112	1	shade-tolerant deciduous	eastern
Canso Coastal Barrens WA	8000	1	coastal coniferous	Atlantic
Economy River WA	6123	1	shade-tolerant deciduous	northern
Eigg Mountain-James River WA	4170	2	shade-tolerant deciduous	northern
Gabarus WA	3745	1	coastal coniferous	Atlantic
Gully Lake WA	3810	2	shade-tolerant deciduous	northern
Middle River Framboise WA	5636	1	shade-tolerant deciduous and coniferous	eastern
Ogden Round Lake WA	5490	1	deciduous	eastern
Portapique River WA	2054	1	shade-tolerant deciduous	northern
Tangier Grand Lake WA	16040	3	coastal coniferous	Atlantic
Terence Bay WA	4450	1	coastal coniferous	Atlantic
Tobeatic WA	103780	2	coniferous	western
Waverley-Salmon River Long Lake WA	8707	1	coniferous	eastern

*From Davis and Browne (1999)

METHODS

Within protected areas, study sites were selected that were likely to harbour the greatest diversity of epiphytic cyanolichens. For inland protected areas, all old growth forests were surveyed, but where no old growth forests occurred, representative mature shade-tolerant hardwood forest were selected. For the Tangier Grand Lake and Terence Bay Wilderness Areas, *Erioderma pedicellatum* habitat suitability maps (Cameron 2004) were used to identify study sites. For other coastal areas (Gabarus and Canso Coastal Barrens Wilderness Areas), forests with balsam fir and red maple (*Acer rubrum*) were selected for study.

Only epiphytic cyanolichens were surveyed because they are at the most risk from impacts of air pollution and habitat destruction. A floristic approach to surveys was taken to ensure rarer species were included (Newmaster et al. 2005). Surveys consisted of walking the site and examining tree boles at heights between 0.5 and 2 m. Lower boles were not examined to avoid inclusion of terricolous or saxicolous species. Branches were ignored because there was very few branches on lower boles in these mature and old growth forests. The area of survey at each site varied from four to about 20 hectares and was largely determined by on-the-ground subjective assessment of the habitat for cyanolichen diversity. Voucher specimens were collected for each species, except the most rare, and deposited at the Nova Scotia Museum of Natural History. Nomenclature follows Esslinger (1997). The forest type at each site was described by tree maturity, tree species occurrence and relative abundance.

Abundance for each lichen species at each site was rated according to the following scale.

1.On <10% of the tree bole and on <10% of the trees.
2.On < 10% of the tree bole and on >10% of the trees.
3.On >10% of the tree bole and on <10% of the trees.
4.On >10% of the tree bole and on >10% of the trees.

The abundance scale was based on a predicted distribution pattern of lichen species. Many groups of organisms demonstrate a logarithmic distribution, with a few species at very high abundances and most species with low abundances (Krebs 1989). Unpublished data on macrolichen abundance and frequency on one hundred and sixty trees in Nova Scotia was examined to determine distribution pattern. More than half of the macrolichen species occurred on less than 10% of the trees. Abundance data also revealed that about half the species had less than 10% tree coverage. The tree species on which particular lichens was found at each site was also recorded.

To determine if the majority of epiphytic lichen species had been sampled within protected areas in Nova Scotia a species accumulation curve was done using methods employed by Roberts-Pitchette and Gillespie (1999).

RESULTS

Twenty-one species of cyanolichen were found at twenty sites in fourteen protected areas (Table 2, proceeding page). Of all surveyed protected areas, Tangier Grand Lake and Terence Bay Wilderness Areas had the most cyanolichen species (15 and 12 species respectively). Protected areas immediately on coastal headlands had the fewest number of species. Only four species were found at Canso Coastal Barrens Wilderness Area and only two species were found at Gabarus Wilderness Area. The low numbers of species may be attributable to lack of suitable substrate and the drying effects in these windy locations. Inland sites ranged in species richness between 4 and 10 species. Bornish Hills Nature Reserve and Tobeatic Wilderness Area had consistently high cyanolichen abundance values but also tended to have fewer species.

SPECIES RESULTS

Coccocarpia

Coccocarpia palmicola was found at several sites within the Tangier Grand Lake Wilderness Area (Table 1). Abundance was low for all sites. Balsam fir was the dominant tree species on which it was found, although occasionally it was found on black spruce. Forest types included balsam fir dominated stands with some black spruce and scattered red maple. Other cyanolichens occurring with *C. palmicola* were *Lobaria scrobiculata, Leptogium laceroides, Parmeliella triptophylla* and *Erioderma pedicellatum*.

Coccocarpia palmicola is rare in Fundy National Park, New Brunswick (Gowan and Brodo 1988) and elsewhere in Canada (Goward et al.1998). One other unpublished record is from Thomas Raddall Provincial Park in southwest Nova Scotia. This lichen was discovered during the Tuckerman Workshop in 1998 (Richardson pers. comm.) and was one of the rarest epiphytic cyanolichens found in this study.

Collema

Three species of *Collema* were found on sugar maple or red maple. *Collema subflaccidum* had the widest distribution, occurring in six of thirteen protected areas. Abundance for this species ranged from 1 to 4 *Collema subflaccidum* was found once on white spruce *(Picea glauca*) in Gabarus Wilderness Area. *Collema furfuraceum* and *C. nigrescens* were found at only two and three Wilderness Areas respectively.

The forests where surveys were conducted were dominated by sugar maple, yellow birch with some beech, red maple and red spruce with the exception of Gabarus Wilderness Area which was dominated by white spruce and balsam fir and Tangier Grand Lake and Terence Bay Wilderness Area where forests were dominated by balsam fir with some black spruce and red maple.

Collema subflaccidum has also been collected in northeastern Nova Scotia (Sneddon unpublished data, Selva 1999). Gowan and Brodo (1988) found *C. subflaccidum* common on their study site in Fundy National Park in New Brunswick. Selva (1994) suggests that this species may be faithful to old forest. However, the wide distribution indicates that the species may not be restricted to old forests. Brodo et al.

Table 2. The abundance of epiphytic cyanolichens in selected protected areas in Nova Scotia. 1= on <10% of the tree bole and on <10% of the trees; 2 = on < 10% of the tree bole and on >10% of the trees; 3 = on >10% of the tree boles and on <10% of the trees; 4 = on >10% of the tree bole and on >10% of the trees.

	Boggy Lake	Bornsih Hills	Canso Coastal Barrens	Economy River	Eigg Mountain	Gabarus	Gully Lake	Middle River Framboise	Ogden Round Lake	Portapique River	Tangier Grand Lake	Terence Bay	Tobeatic	Waverley Salmon River
Coccocarpia palmicola											1			
Collema furfuraceum								1			1	1		
Collema nigrescens				3			1							
Collema subflaccidum		4		3		1	2		1	3				
Degelia plumbea												3		
Erioderma pedicellatum											1			
Leptogium corticola											1			
Leptogium cyanescens			1				3	2	1	3				
Leptogium laceroides							1		1	1	1	1		
Leptogium saturninum	1									1				
Lobaria pulmonaria	4	4	3	4	4	3	4	4	3	4	2	3	4	3
Lobaria quercizans	4	4		4	2		3	4	1	4	3	3	4	
Lobaria scrobiculata			1	1	3		3		3		3	1	3	3
Nephroma bellum	2							2	1		1	1		
Nephroma helveticum									1		1			
Nephroma laevigatum			1				1				1			
Parmeliella triptophylla		3					1	1	2	1	3	1		
Pannaria conoplea											1	1		
Pseudocyphellaria crocata							1				3	1	3	1
Pseudocyphellaria perpetua											1	1		
Sticta fuliginosa										1		1		

(2001) suggests *C. furfuraceum* is common in North America and Selva (1994) suggests the species may be faithful to old forests in northeastern North America. Seaward et al. (1997) report finding *C. furfuraceum* in central Nova Scotia. Selva (1999) found *C. furfuraceum* common on his study sites in Cape Breton while Gowan and Brodo (1988) found the species rare in New Brunswick. Data from the current study suggests this species is uncommon with low abundance on the trees on which it is found. The seemingly contradictory evidence suggests this species may need further investigation. Brodo et al (2001) suggests *C. nigrescens* is common in North America, however there are no published records of this species from Nova Scotia. It may be an overlooked species that requires more effort to assess its status.

Degelia

Degelia plumbea was found at one site in Terence Bay Wilderness Area on red maple. Coverage on the trees was high (greater than 10% of the bole). The forest type was poorly drained and dominated by black spruce and balsam fir with scattered red maple adjacent to a black spruce bog.

Degelia plumbea is considered very rare in North America (Brodo et al. 2001) and rare in Canada (Goward et al. 1998). Only six locations have been published for North America from Maine to Newfoundland including one from Cape Breton (Goward et al. 1998).

Erioderma

Erioderma pedicellatum was found at two locations within the Tangier Grand Lake Wilderness Area. Abundance was low for both sites. All thalli were found on balsam fir. The forest type was balsam fir dominated stands with some black spruce and scattered red maple; in both cases adjacent to a bog. Other cyanolichens occurring with *E. pedicellatum* were *Coccocarpia palmicola, Lobaria scrobiculata, Leptogium laceroides* and *Parmeliella triptophylla*.

The Maritime population of *E. pedicellatum* is listed as endangered under the Canadian Species At Risk Act, as well under the Nova Scotia Endangered Species Act. Prior to the current record, only one other location of the species was known for Nova Scotia (Cameron 2004).

Leptogium

Leptogium cyanescens was the most common *Leptogium*, occurring in five of the thirteen protected areas studied. The abundance for this species ranged from 1 to 3. *Leptogium laceroides* was the next most common species, occurring in 5 protected areas with low abundance at all sites. *Leptogium corticola* and *L. saturninum* were both rare occurring in only one and two protected areas respectively, with only one thallus present at each site. *Leptogium corticola* and *L. laceroides* were found on red maple in coastal coniferous forest dominated by balsam fir with some red maple and black spruce. *Leptogium laceroides* was also found with *L. cyanescens* and *L. saturninum* at Portapique River Wilderness Area in forests dominated by sugar maple, yellow birch with some beech, red maple and in a floodplain forest of mixed sugar maple and white ash (*Fraxinus americana*).

Brodo et al. (2001) suggest *L. cyanescens* is the most common *Leptogium* in North America; indeed it is common in New Brunswick (Gowan and Brodo 1988), Cape Breton (Selva 1999) and in this study. Brodo et al. (2001), Goward et al. (1998), Selva 1999 and Gowan and Brodo (1988) all suggest *L. laceroides* is rare. It was found in the present study, in central Nova Scotia (Seaward et al. 1997) and in eastern Cape Breton (Sneddon unpublished data). *Leptogium saturninum* is considered rare in New Brunswick (Gowan and Brodo 1988) and in Canada (Brodo et al.2001) and not common in Cape Breton (Selva 1999). Little has been documented for *L. corticola*. No published studies have recorded *L. corticola* in Nova Scotia and it is considered rare in Canada by Brodo et al. (2001). *Leptogium corticola, L. laceroides* and *L. saturninum* were reported for Thomas Raddall Provincial Park in southwest Nova Scotia during the Tuckerman Workshop in 1998 (Richardson pers. comm.). *Leptogium corticola* and *L. saturninum* are both rare within Nova Scotia, occurring at few sites and with low abundance where they do occur. *Leptogium laceroides* appears to be more common than *L. corticola,* and *L. saturninum,* yet is still considered uncommon to rare.

Lobaria

All three *Lobaria* species known to occur in Nova Scotia were found with relatively high abundance in most protected areas. *Lobaria pulmonaria* was the most common and abundant species occurring in all sites with abundances of 3 or 4. *Lobaria quercizans* was next most common occurring in 9 protected areas commonly with abundances of 3 or 4. *Lobaria scrobiculata* occurred in 8 protected areas with abundances of 1 or 3. *Lobaria scrobiculata* tended to occur on many trees at a site but had low coverage on the trees. *Lobaria pulmonaria* and *L. quercizans* often had high coverage on trees as well as occurring on many trees at a site. All three species were found on red maple and sugar maple. *Lobaria pulmonaria* and *L. quercizans* were also found on yellow birch. At coastal sites (Canso Coastal Barrens, Gabarus, Tangier Grand Lake and Terence Bay Wilderness Areas), *L. pulmonaria* and *L. scrobiculata* occurred on balsam fir, black spruce and white spruce. *Lobaria quercizans* did not occur at sites within 10 km of the coast (Canso Coastal Barrens and Gabarus Wilderness Areas).

Both *L. pulmonaria* and *L. quercizans* were found to be common in Cape Breton (Selva 1999) and in New Brunswick (Gowan and Brodo 1988). Casselman and Hill (1995) found *L. pulmonaria* extremely abundant and *L. quercizans* abundant in Pictou County. *Lobaria scrobiculata* was found to be common in New Brunswick (Gowan and Brodo 1988) and in central Nova Scotia (Casselman and Hill 1995) but Selva (1999) observed that it was not common in Cape Breton. All three *Lobaria* species are common and widespread in Nova Scotia but *L. quercizans* seems to be more restricted to inland mature shade-tolerant

hardwood forests while *L. pulmonaria* and *L. scrobiculata* are found in shade-tolerant hardwood as well as coastal forests.

Nephroma

Nephroma bellum was the most common species of this genus, occurring in 5 protected areas with relatively low abundance. *Nephroma laevigatum* occurred at three protected areas and *N. helveticum* occurred at only two. Both *N. laevigatum* and *N. helveticum* had abundance of only 1 at each site. All three species were found on sugar maple and red maple in shade-tolerant hardwood forest dominated by sugar maple, yellow birch with some beech, red maple and red spruce or on red maple in balsam fir-white spruce dominated coastal forest.

All three species were considered not common by Selva (1999) in Cape Breton while Gowan and Brodo (1988) considered both *N. bellum* and *N. helveticum* as rare in New Brunswick. Gowan and Brodo (1988) had no record of *N. laevigatum* in their study site in New Brunswick. *Nephroma bellum* and *N. helveticum* have been recorded in eastern Cape Breton by Sneddon (unpublished data). All three species were reported for Thomas Raddall Provincial Park while *N. laevigatum* and *N. helveticum* were reported for Kejimkujik National Park during the Tuckerman Workshop in 1998 (Richardson pers. comm.). All three species occur at low abundance at few sites and are considered uncommon in Nova Scotia.

Pannaria

The only species in the genus *Pannaria*, in this study, was *P. conoplea,* found at Tangier Grand Lake and Terence Bay Wilderness Areas. Abundance was very low at Tangier Grand Lake Wilderness Area, where only one thallus was found. Terence Bay Wilderness Area had higher abundance with numerous thalli found on several trees. All thalli occurred on red maple, in balsam fir dominated forest with some black spruce and scattered red maple.

Pannaria conoplea is rare across North America (Brodo et al. 2001) including New Brunswick (Gowan and Brodo 1988) and Maine (Hinds and Hinds 2004). No previously published records are known for this species in Nova Scotia, however a few unpublished records exists for Cumberland County (Maass pers. comm.), Thomas Raddall Provincial Park and Kejimkujik National Park in south west Nova Scotia (Richardson pers. comm.).

Parmeliella

Parmeliella triptophylla was found in seven protected areas with abundances ranging from 1 to 3. *Parmeliella triptophylla* was found on red maple in Tangier Grand Lake and Terence Bay Wilderness Areas in forests dominated by balsam fir and with scattered red maple and black spruce. It was found on both red maple and sugar maple in shade-tolerant hardwood forests in other protected areas.

Brodo et al (2001) suggest *P. triptophylla* is "frequent in cool humid coniferous forest" which is consistent with its "common" status by both Selva (1999) in Cape Breton and Gowan and Brodo (1988) in New Brunswick. There are no records for this species in other Nova Scotian study sites. *Parmeliella triptophylla* seems to be a common but often overlooked species in Nova Scotia.

Pseudocyphellaria

One specimen of *P. perpetua* was found at each of Terence Bay and Tangier Grand Lake Wilderness Areas. These were both large thalli occurring on red maple in a forest dominated by balsam fir with scattered red maple and black spruce. *Pseudocyphellaria crocata* was also found at these same Wilderness Areas as well as 4 other protected areas. Coverage of *P. crocata* on tree trunks was low (<10% of the bole) at all sites but was inconsistent in the number of trees on which it occurred.

Pseudocyphellaria crocata is rare in Cape Breton (Selva 1999) and New Brunswick (Gowan and Brodo 1988). *Pseudocyphellaria crocata* was found in central Nova Scotia by Seaward et al. (1997). Since *P. perpetua* has only recently been distinguished as a new species (Miadlikowska et al. 2002), there are no published records of its occurrence in Nova Scotia. Some other Nova Scotia collections were made during the Tuckerman Lichen Workshop in 1998 (Richardson pers. comm.) and by Dr. W. Maass (pers. comm.). Some overlap in morphological features that supposedly distinguish these two species was noted and therefore these identifications may be uncertain.

Sticta

Sticta fuliginosa was found at Portapique River Wilderness Area on a sugar maple in a floodplain shade-tolerant hardwood forest made up of sugar maple and white ash. At Terence Bay Wilderness Area, *S. fuliginosa* was found on a red maple in a forest dominated by balsam fir with scattered red maple and black spruce.

Sticta fuliginosa is rare in New Brunswick (Gowan and Brodo 1988) and Maine with no recent records in that state (Hinds and Hinds 2004). The only other known locations for this species in the province are in Chignecto Provincial Park (Maass pers. comm..), Halifax County, found by the lead author and Thomas Raddall Provincial Park (Richardson pers. comm.). This species is very rare in Nova Scotia known from only a few locations.

DISCUSSION

Epiphytic cyanolichens, like many other groups of organisms, appear to have a typical distribution in that there are a few species that are very abundant, but most species are uncommon or rare. Species of the genus *Lobaria* were all very common together with *Collema subflaccidum*, *Leptogium cyanescens* and *Parmeliella triptophylla*. Uncommon species included *Collema furfuraceum, Collema nigrescens, Nephroma bellum* and *Pseudocyphellaria crocata.* Rare species were *Coccocarpia palmicola, Degelia plumbea, Erioderma pedicellatum, Leptogium corticola, Leptogium laceroides, Leptogium saturninum, Nephroma laevigatum, Nephroma helveticum, Pannaria conoplea, Pseudocyphellaria perpetua* and *Sticta fuliginosa*.

Rare and uncommon epiphytic cyanolichens seem to reflect several patterns of rarity. Within a geographic region, rare species can follow one of three patterns: 1. High abundance at a few locations; 2. low abundance occurring at a large number of locations; and 3. low abundance at few locations (Rabinowitz 1981). Those cyanolichens listed above as "rare", all occur at low abundance in only a few protected areas. Uncommon cyanolichens, *Collema furfuraceum* and *Nephroma bellum*, tend to have low abundance at a frequent number of sites. *Collema nigrescens* and *Pseudocyphellaria crocata* were inconsistent in their distribution pattern with high abundance at some sites and low abundance at others. It is possible that marginal habitat was surveyed where *C. nigrescens* and *P. crocata* abundance is low.

Some cyanolichens may be rare because they are at the limit of their climatic range in Nova Scotia. Brown et al. (1995) suggest that some organisms have highest abundance at the centre of their range and as distance from this centre increases conditions become less favourable and abundance decreases. *Coccocarpia palmicola, Collema furfuraceum, C. nigrescens* and *Leptogium corticola* are at the northern extent of their range in Nova Scotia (Brodo et al.2001). *Erioderma pedicellatum*, one of the rarest lichens, is at the southern extent of its range in Nova Scotia (Maass and Yetman 2002).

Other cyanolichens in Nova Scotia may be rare because they occupy specialized niches or rare habitats (Hunter 2002, Benayas et al. 1999). For example, nine species found in this study are thought to be restricted to old growth forest (Rose 1976, Leisca et al 1991, Selva 1994). Protected Areas with old growth or near old growth forest include Boggy Lake, Economy River, Portapique River and Eigg Mountain-James River Wilderness Areas and Bornish Hills Nature Reserve (Cameron 2004). Coastal forest found in Canso Coastal Barrens and Tangier Grand Lake Wilderness Areas may not be old growth forest but likely have a long continuity of forest cover.

Some cyanolichens seem to be restricted to humid coastal forest and thus niche specialists in Nova Scotia. Humid coastal forest in Nova Scotia consists of a narrow band, several kilometres wide, along the Atlantic coast (Davis and Browne 1999). Precipitation is high (1400 to 1500 mm per year) with much of that falling as rain. Fog is frequent and the temperature is often above freezing in winter. Proximity to the coast may also mean that air is laden with dissolved salt, thus requiring salt tolerance for organisms living in the coastal zone. Some of the rarest cyanolichens in this study, and in North America, seem to be restricted to these forests. These species include *C. palmicola, E. pedicellatum, L. corticola* and *Pannaria conoplea.* However, *L. saturninum* and *S. fuliginosa* occur in humid old growth forest as well. Maass and Yetman (2002) termed such forests humid sub-oceanic lichen forests.

This study did not assess the species richness of cyanolichens in the province. The species accumulation curve revealed that, with only 20 sites sampled, not all epiphytic cyanolichens have been found. Other studies suggest that there are at least 19 other epiphytic cyanolichens which probably occur in the region but were not recorded in this study (Gowan and Brodo 1988, Selva 1999).

Despite the small number of sites surveyed, the study was successful in documenting some of the rarest lichens in the region. Knowing the locations of rarities and the lichen rich areas can help in managing protected areas. Identifying important protected areas for lichens enable better planning for conservation and recovery of endangered lichens. Furthermore, abundance measures indicate rarity, distribution patterns, and can be used for long-term monitoring.

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Hypotrachyna showmanii, A Misunderstood Species From Eastern North America

JAMES C. LENDEMER[1] & RICHARD C. HARRIS[2]

ABSTRACT. – *Hypotrachyna showmanii* Hale has been found to be widely distributed in eastern North America. It contains 5-*0*-methylhiascic acid, other members of the hiascic acid complex, and gyrophoric acid in the medulla, not "horrescens" unknowns and just traces of gyrophoric acid as previously reported. The status of the species, and its relationship to other pustulose species of *Hypotrachyna* and *Parmelinopsis* is discussed. A key to the pustulose *Hypotrachyna* and *Parmelinopsis* species in eastern North America is provided.

INTRODUCTION

When Hale (1976) described *Hypotrachyna showmanii* he considered it to be a rare species that produced esorediate pustules. He also reported the medullary chemistry to include what he termed the "horrescens" unknowns (also found in *Parmelinopsis horrescens* (Taylor) Elix & Hale) as well as traces of gyrophoric acid (Hale, 1976). Following its description, *H. showmanii* was considered a rare species with a restricted distribution and was represented in herbaria by only a few collections none of which were widely distributed.

Recently, lichenologists in eastern North America became aware of a pustulose lichen with atranorin in the cortex that seemed to represent a species of *Hypotrachyna* or *Parmelinopsis*. The taxon bore some resemblance to *Parmelinopsis spumosa* (Asah.) Elix & Hale however differed in several respects (Lendemer & Harris 2004). Since the species is widespread it seemed unlikely to have escaped detection in an area where foliose lichens are so well known. After being continuously puzzled by the taxon both in the field and herbarium we began to wonder if it might represent *Hypotrachyna showmanii* Hale. We also wondered if the chemistry of *H. showmanii* had initially been misinterpreted. Comparison of our material to the figures provided by Hale (1976) when describing *H. showmanii* led us to examine an isotype of the species which proved to be identical to our material.

This study is based primarily on material from the following herbaria: NY, O, OSU, hb. Cleavitt, and hb. Lendemer. All specimens of *H. showmanii* were subjected to TLC analysis (in solvent C or A). The authors also observed the species in the field during numerous trips throughout eastern North America.

DISCUSSION

Among the pustulose species of *Hypotrachyna* and *Parmelinopsis* in eastern North America, *H. showmanii* is the only species that does not produce schizidia or soredia from a breakdown of the pustules. Showman & Flenniken (2004) reported that *H. showmanii* was pustulose-sorediate. However, it seems likely that their report of soredia is a result of the misinterpretation of the fragmentation of the pustules after collecting (e.g., by pressing). True pustules are fragile structures (see Hale 1975), so specimens that have had force applied to them often have areas that appear sorediate. Close examination of these areas reveals them to be crushed pustules rather then actual schizidia or soredia produced from the breakdown of the pustules. It is also possible their concept of *H. showmanii* included material of *H. afrorevoluta*, a pustulose sorediate species, which has recently been reported from North America (Knudsen & Lendemer, 2005).

[1]James C. Lendemer: Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Pky., Philadelphia, PA, USA, lendemer@acnatsci.org

[2] Richard C. Harris: Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458-5126, USA.

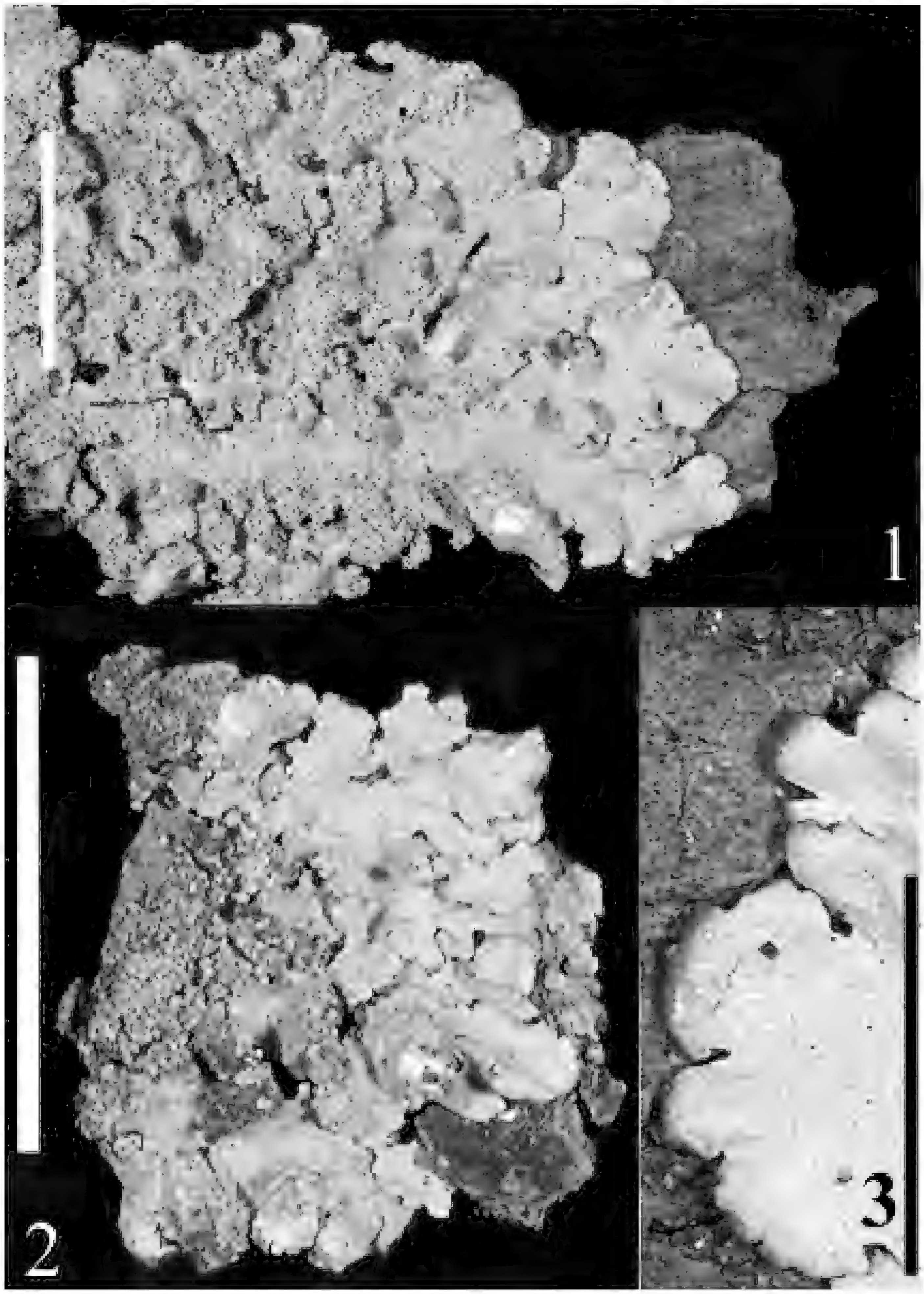

Plate 1. *Hypotrachyna showmanii*. Fig. 1. *Lendemer 2331*. Fig. 2. *Showman V-12., isotype.* Fig. 3. Detail of isotype showing maculate lobe tips and browned lobe margins. Scale bar = 1 cm.

The medullary chemistry of *H. showmanii* is of particular interest because it has been used in the past as a primary character to distinguish it from other superficially similar taxa in eastern North America. While Hale (1976) reported that the medulla of *H. showmanii* contained traces of gyrophoric acid in addition to the "horrescens unknowns" our reexamination of the isotype in OSU revealed that the medulla in fact contains gyrophoric acid in more than just "trace amounts" in addition to members of the hiascic acid complex including 5-*0*-methylhiascic acid. The medullary chemistry of *H. showmanii* is not similar to *Parmelinopsis horrescens* which contains 3-methoxy-2,4-di-*O*-methygyrophoric acid as the major constituent (Nash & Elix 2003) and thus is C- and KC+ pink/red. Instead it is similar to *H. afrorevoluta* and *Parmelinopsis minarum* in containing significant amounts of gyrophoric acid as well as members of the hiascic acid complex, thus reacting C+ pink/red and KC+ pink/red.

As noted by Knudsen & Lendemer (2005) *H. afrorevoluta* (Krog & Swinscow) Krog & Swinscow, originally described from Africa (Krog & Swinscow 1979), and later reported from many other regions is similar to *H. showmanii.* The species was recently found in North America (Knudsen & Lendemer 2005). It is easily distinguished from *H. showmanii* in having emaculate, revolute lobe tips, sorediate pustules, and a more densely rhizinate underside with the longer rhizines.

As noted by Krog & Swinscow (1979) *H. afrorevoluta* has marginal cilia and following Hale's generic system the species would not be placed in *Hypotrachyna*. In fact, later authors (Elix & Hale 1987) have placed the species in *Parmelinopsis* which differs from *Hypotrachyna* primarily by the presence of marginal cilia. *Hypotrachyna showmanii* also possesses such marginal cilia, clearly linking it to the material we have previously referred to *Parmelinopsis spumosa* with question (Lendemer & Harris 2004, Harris & Lendemer 2005) as well as to *H. afrorevoluta*. We have chosen to follow Krog & Swinscow (1987) and retain *H. afrorevoluta* in *Hypotrachyna* pending a study using molecular techniques. It seems only logical to treat *H. showmanii* in a similar manner and thus a new combination in *Parmelinopsis* is not made.

CONCLUSION

Hypotrachyna showmanii, has been considered a rare species primarily confined to the Ohio Valley with a C-, KC+ pink/red medulla (Brodo et al. 2001). Hale's original description (1976) incorrectly reported the medullary chemistry. Examination of the isotype material of *H. showmanii* revealed that instead of having a C-, KC+ red medulla as reported by Hale (1976) and subsequently by Brodo et al. (2001), the species has a C+ pink/red, KC+ pink/red medulla due to the presence of gyrophoric acid in addition to the hiascic acid complex. With the corrected chemistry in mind the material previously referred with question to *Parmelinopsis spumosa* by the authors in several recent checklists is considered conspecific with *H. showmanii*. Thus, the range of *H. showmanii* is extended to include most of north/central eastern North America and the species is considered to be widely distributed but relatively uncommon. To facilitate the accumulation of additional records we have provided a key (appendix I) to the pustulose species of *Hypotrachyna* and *Parmelinopsis* in eastern North America including *H. showmanii* and *H. afrorevoluta,* which was recently reported as new to North America. Additionally, a selection of specimens documenting the newly established range of *H. showmanii* is provided (appendix II).

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APPENDIX I

KEY TO PUSTULOSE HYPOTRACHYNA & PARMELINOPSIS IN EASTERN NORTH AMERICA

1. Cortex UV+ yellow (lichexanthone); medulla K+ brownish-purple (lividic acid complex)…***H. osseoalba*** (Vain.) Park & Hale
1. Cortex UV- (atranorin); medulla chemistry various……………………………………………………….…**2**

2. Medulla PD+ orange-red (protocetraric acid), with yellow-red/orange pigment; high elevation southern Appalachians……………………………………………***H. croceopustulata*** (Kurok.) Hale
2. Medulla PD- (lacking protocetraric acid), pigment absent or dull yellow; distribution various……...**3**

3. Medulla white, K+ & KC+ brownish-purple, C-, (lividic acid)…..***H. pustulifera*** (Hale) Skorepa
3. Medulla white or pigmented, K-, KC+, C± (chemistry various)……………………………..…**4**

4. Medulla C-, KC+ red (alectoronic acid present)……………***H. densirhizinata*** (Kurok.) Hale
4. Medulla C+ pink/red or orange, KC+ pink/red or orange……………………………………**5**

5. Medulla C+ orange (barbatic acid agg.)…………………….…***H. laevigata*** (Sm.) Hale
5. Medulla C+ pink/red………………………………………………………………………...**6**

6. Medulla C+ red (lecanoric acid and evernic acid); thallus pustulose-schizidiate; Appalachians/Ohio Valley……………………***H. taylorensis*** (M.E. Mitch.) Hale

6. Medulla C+ pink (gyrophoric acid)………………………………………………..**7**

7. Pustules absent (eroding soralia present); lobe tips revolute; medulla with gyrophoric acid and hiascic acid complex………….***H. revoluta*** (Flot.) Hale
7. Pustules present, sorediate or not; lobe tips various; medulla with gyrophoric acid ± hiascic complex…………………………………………………...…**8**

8. Lobe tips maculate; thallus pustulose; medulla white, with gyrophoric acid + hiascic acid complex…………...………….***H. showmanii*** Hale
8. Lobe tips emaculate; thallus pustulose-sorediate; medulla white or yellowish, with gyrophoric acid ± hiascic acid complex……..………**9**

9. Pustules subterminal; w/o hiascic acid complex...***H. oostingii*** (Dey) Hale
9. Pustules laminal; hiascic acid complex present or absent……...……**10**

10. Medulla white, with gyrophoric acid + hiascic acid complex; lobe tips revolute; absent from SE coastal plain..................…
.......***H. afrorevoluta*** (Krog & Swinscow) Krog & Swinscow
10. Medulla yellowish, with gyrophoric acid $\pm$ hiascic acid complex; lobe tips not revolute; SE coastal plain…………
………………….............***P. "spumosa"*** (Asah.) Elix & Hale

APPENDIX II

SELECTED SPECIMENS EXAMINED

The selected cited specimens below are intended to establish the newly revised geographic range of *H. showmanii.* Herbarium citations follow *Index Herbariorum* and the herbarium of the first author is abbreviated (hbL). A collection of *H. showmanii* will be distributed by the first author in the next fascicle of *Lichens of Eastern North America*.

Selected Specimens Examined. – **USA. CONNECTICUT.** LITCHFIELD CO.: Holleran Swamp Preserve, *Harris 47967* (NY). **KENTUCKY.** HARLAN CO.: Profile Rock, Kentenia State Forest, *Harris 27161* (NY). LETCHER CO.: Bad Branch Nature Preserve, *Harris 27073* (NY). **MASSASCHUSETTS.** HAMPSHIRE CO.: Chesterfield, *Rolih s.n.* (NY). **NEW JERSEY**. BURLINGTON CO.: Wharton State Forest, *Lendemer 961 & Smith* (hbL). **NORTH CAROLINA.** GRAHAM CO.: Nantahala National Forest, Stratton Ridge, *Harris 40995* (NY). MACON CO.: Nantahala National Forest, along Jones Creek, *Harris 41178* (NY). **OHIO**. FAIRFIELD CO.: Rhododendron Hollow State Nature Preserve, *Showman s.n.* (OSU). GALLIA CO.: sine loc., *Showman s.n.* (OSU). HOCKING CO.: sine loc., *Showman s.n.* (OSU). LAWRENCE CO.: Decatur Township, *Showman s.n.* (OSU). MEIGS CO.: Mt. Herman Churchyard, *Showman s.n.* (OSU). SCIOTO CO.: Old Hoffer Hill Church, *Showman s.n.* (OSU). VINTON CO.: Mead-Raccoon area, near Oreton Fire Tower, *Showman V-12* (OSU). **PENNSYLVANIA**. CARBON CO.: Hughes Swamp, *Lendemer 2384 & Rhoads* (hbL). LUZERNE CO.: Rickets Glenn State Park, *Lendemer 2231 & Macklin* (hbL, NY). PIKE CO.: Delaware Water Gap National Recreation Area, *Lendemer 2622 & Harris et al.* (hbL). SULLIVAN CO.: Wyoming State Forest, *Lendemer 2386 & Macklin* (hbL). **TENNESSEE.** CARTER CO.: Roan Mountain State Park, *Harris 30897* (NY). **VERMONT.** LAMOILLE CO.: Babcock Nature Preserve of Johnson State College, *Harris 51367* (NY), *Harris 51368* (NY). **WEST VIRGINIA.** MASON CO.: sine loc., *Showman s.n.* (OSU). POCAHONTAS CO.: Watoga State Park, Brooks Memorial Arboretum, *Harris 43974* (NY).

The species has also been reported from Virginia, USA by Hale (1976) however we have not reviewed the specimen.

Contributions to the Lichen Flora of New Jersey: A Preliminary Checklist of the Lichens of Wharton State Forest

JAMES C. LENDEMER[1]

ABSTRACT. – A preliminary checklist of lichens and lichenicolous fungi of Wharton State Forest, New Jersey, USA, reports 190 named taxa as the result of recent survey work. *Abrothallus cladoniae* R. Sant. & D. Hawks. was found on *Cladonia coniocraea* (Flörke) Spreng. The following species are reported for the first time from New Jersey: *Acrocordia megalospora* (Fink) R.C. Harris, *Agonimia opuntiella* (Buschardt & Poelt) Vězda, *Bacidia coprodes* (Körb.) Lettau (Syn. *Bacidia granosa* (Tuck.) Zahlbr.), *Chaenothecopsis savonica* (Räsänen) Tibell, *Chrysothrix flavovirens* Tønsberg, *Peltigera didactyla* (With.) J.R. Laundon, *Phaeophyscia hirsuta* (Mereschk.) Essl., *Physcia pumilior* R.C. Harris, *Parmotrema subisidiosum* (Müll. Arg.) M. Choisy, *Psoroglaena dictyospora* (Orange) Harada, *Sarea resinae* (Fr.) Kuntze, *Schismatomma pericleum* (Ach.) Branth & Rostrup, *Trapelia placodioides* Coppins & P. James, and *Vezdaea leprosa* (P. James) Vězda.

INTRODUCTION

As Brodo (1968) noted, the lichen flora of eastern North American has received considerable study in comparison to other regions of the world. Indeed, material from the region was sent to some of the seminal figures of lichenology by Henry Muhlenberg and Lewis David von Schweinitz (Lendemer & Hewitt, 2002). Many early figures such as Edward Tuckerman and Henry Willey also contributed significantly to understanding the lichens of the region. Interestingly, despite being under study for over two centuries, the lichen flora of eastern North America still remains poorly known, and recent work has continued to illustrate just how much remains to be discovered.

Within the context of southern New Jersey, the lichen flora of Wharton State Forest is of particular interest, because it includes areas that have been under nearly continuous study since prior to the industrial revolution in North America (*cf.* Austin, 1881). Thus there exists the opportunity to document the changes in the lichen flora over time. The forest also includes most of the habitat/vegetation types present in southern New Jersey (as summarized by Forman, 1998a), and serves as a good representation of the region as a whole. It seemed only logical that when the opportunity presented itself, an intensive survey of the largest state forest (~110,000 acres) in the region should be undertaken.

Wharton State Forest is well known for its pine barrens. Within the "pine barrens" are any number of smaller subtypes whose lichen flora differs significantly depending on the elevation, proximity to water, understory composition, and dominant canopy species. Most of the upland portions of the forest consist of extensive pine (primarily *Pinus rigida*) - oak (*Quercus velutina, Q. alba, Q. ilicifolia, Q. rubra, Q, marilandica,* etc.) forests with the oaks and pines varying in abundance and dominance. Burned areas are dominated by pitch pine (*Pinus rigida*), while unburned areas are dominated by oaks. Swamp forests are primarily dominated by Atlantic white cedar (*Chamaecyparis thyoides*) and red maple (*Acer rubrum*), often with an understory of ericaceous shrubs, such as *Vaccinium corymbosum* and *Leucothoe racemosa*. Open areas along major rivers can be described as savannas with scattered Atlantic white cedar and pitch pine. There are also extensive peaty wetlands dominated by low ericaceous shrubs and sedges. For detailed descriptions of pineland habitats see Forman et al. (1998a).

[1] James C. Lendemer: Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Pky., Philadelphia, PA, 19103, USA. – email: lendemer@acnatsci.org

MATERIALS AND METHODS

In October 2004 I began to survey the lichen flora of Wharton State Forest for this study. Due to vehicular constraints (the use of a bicycle), most of the fieldwork was carried out within several miles of the town of Batsto, Burlington County. Aside from the limits initially imposed by transportation, the portion of the forest surrounding Batsto was of particular interest because it is located just above the junction of the Mullica and Batsto Rivers. This close proximity to several sources of water is likely what accounts for the varied habitat and significant diversity (as well as sheer volume) of lichens. Pleasant Mills Cemetery is also located close to the junction of the two rivers, and was regularly visited, since it provides a rare habitat for saxicolous lichens (see locality discussion in appendix). In addition to the solo collection trips made every Saturday from October 2004 to December 2004, I also surveyed the northeastern portion of the forest in November 2004 as part of a trip with R.F. Lendemer. Periodic collection trips with A.E. Schuyler were also made from January to August 2005. The northwestern portion of the forest and the area north of Pleasant Mills had been visited extensively prior to this study by me and several other individuals (S.A. Hammer, J.A. Macklin, M.J. Moody, R.F.C. Naczi, A.E. Schuyler, L.H. Smith II, and E. Tripp). The checklist presented here thus includes not only the collections made during this study but also those made during many sporadic trips from 2002 until present. An index (arranged by the citation used in the checklist) to all of these localities is provided in Appendix I.

ANNOTATED CHECKLIST

The checklist presented here should be considered as preliminary with respect to distributions, because only a fraction of the entire study area was surveyed intensively, and additional taxa were found as a result of nearly every collection effort. The list is, nonetheless, fairly complete with respect to total diversity, and most future discoveries are likely to be made in under-collected groups (i.e. crustose lichens and lichenicolous fungi). It is significant to consider, however, that in addition to the many crustose species newly reported here, several previously unreported macrolichens were also found.

The list below is arranged alphabetically by genus and species and includes material that was identified only to genus or family. The collection numbers cited following each locality are those of the author unless otherwise indicated. Though lichenicolous fungi were not directly the focus of this study, they are included and marked with an "*". Sterile crusts for which no names could be found, and for which the author (or others) could not suggest generic placement, are included at the end of the list and are grouped by chemistry. Taxonomy that does not follow official checklists or recent treatments reflects the author's preferences or interpretations, and are usually explained.

Vouchers of all collections cited here been deposited in the herbarium of the author which is currently housed at the Academy of Natural Sciences of Philadelphia (PH) with a nearly full set of duplicates in the herbarium of The New York Botanical Garden (NY). In an effort to increase the usefulness of this list, recent collections from Wharton State Forest deposited in NY (collections of L. Brako, W.R. Buck, and R.C. Harris) are also included when no voucher from the present study was available.

Abrothallus cladoniae R. Sant. & D. Hawks.* - BNI: *3208-A* (on *Cladonia coniocraea* (Flörke) Spreng.).
This is apparently the first reported occurrence of *A. cladoniae* on *Cladonia coniocraea*.

Acrocordia megalospora (Fink) R.C. Harris – BSII: *3371;* GBC: *4292;* PVC: *3158.*
These are the first published reports of the species from New Jersey.

Acarospora glaucocarpa (Wahlenb. ex Ach.) Körb. – AS: *4284.*

Agonimia sp. – BSI: *3286*; SWBAT: *3905, 3914.*
Thallus muscicolous/lignicolous, granular to dispersed areolate, perithecia black, ascospores muriform, hyaline, (33)-36-39 x 12-15µm.

Agonimia opuntiella (Buschardt & Poelt) Vězda – PVC: *3143, 3150.*
This is the first report of this species from New Jersey.

Amandinea polyspora (Willey) Lay & P. May *in* P. May & Sheard – A: *Brako 4898, Harris 16412;* AHF: *1750;* BNI: *3223*; HFI: *3513*; QB: *Buck 36801.*

Anaptychia palmulata (Michx.) Vainio– AR: *4290.*

Anisomeridium polypori (Ellis & Everh.) M.E. Barr – A: *4345;* AR: *4276;* PVC: *3159*; QB: *972*; SWBAT: *3912*.

Anzia colpodes (Ach.) Stizenb. - GBC: *5295*.

Arthonia sp. - SWBAT *3902*.

The material is similar to *Arthonia apatetica* (A. Massal.) Th. Fr., but differs in lacking brown-capped paraphyses and having somewhat larger ascospores.

Bacidia coprodes (Körb.) Lettau – GCB: *4281*.

Esslinger (2005) lists *B. coprodes* as a synonym of *B. trachona* (Ach.) Lettau. According to Llop & Ekman (2004), *B. coprodes* is the correct name for *B. granosa* (Tuck.) Zahlbr., and *B. trachona* is a separate unrelated taxon which the authors do not report from North America. In eastern North America all three of these names can be found in most herbaria, and the material often represents other taxa, especially *Bacidina egenula*.

Bacidia schweinitzii (Fr. *ex* Michener) A. Schneid. – BNII: *3336;* BSI: *3294*; BSIII: *3449*; QB: *Harris 43806*.

Bacidina sp. – SWBAT: *3904* (pycnidia only).

Apothecia have not yet been found associated with material from the region. The thallus is composed of goniocysts and the pycnidia are small and pale without a trace of pigmentation; conidia filiform 38 x 2µm.

Bacidina egenula (Nyl.) Vězda – AHF: *1727;* BSII: *3375*.

Biatora longispora (Degel.) Lendemer & Printzen – A: *4340;* SWBAT: *3909*.

Biatora printzenii Tønsberg – A: *4435*.

Buellia curtisii (Tuck.) Imshaug – A: *4341;* BNI: *3173*; SWBAT: *1477*.

Buellia stillingiana J. Stein. – QB: *Brako 4909*.

Caloplaca citrina (Hoffm.) Fr. – AHF: *1758*.

Caloplaca feracissima H. Magn. – AS: *4283;* PVC: *3272*.

Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth. – AHF: *1749;* PVC: *3145*.

Caloplaca subsoluta (Nyl.) Zahlbr. – PVC: *3235*.

Candelaria concolor (Dicks.) Stein – W: *1004, 1005*.

Candelariella efflorescens Buck & R.C. Harris – QB: *874, 967*.

Candelariella reflexa (Nyl.) Lettau – AHF: *1761*; SWBAT: *3910*.

As has been discussed by Lendemer (2004), sterile sorediate specimens of *Candelariella* from southern New Jersey cannot be named with certainty. Both *C. efflorescens* R.C. Harris & Buck (ascospores > 8 per ascus) and *C. reflexa* (ascospores 8 per ascus) are present in the region, and sterile thalli are morphologically indistinguishable. Previous reports of *C. efflorescens* from the region by other authors need to be confirmed. Semi-diligent searching of a population in the field often results in the discovery of apothecia, so future collections should be made with this in mind.

Catinaria atropurpurea (Schrad.) Poelt & Vězda – BSIII: *3486*.

Chaenotheca hygrophila Tibell – QB: *Buck 36792, Buck 36794, Buck 36802*.

Chaenothecopsis savonica (Räsänen) Tibell – AHF: *1722;* BSIII: *3485;* PVCN: *3368*.

These records represent the first confirmed reports of this species from New Jersey.

Chrysothrix flavovirens Tønsberg – PVCW: *3293*.

Chrysothrix flavovirens is a common species in southern New Jersey, often covering the trunks of trees in Atlantic white cedar swamps. Harris & Lendemer (2005) reported this species as new to North America with the note that North American material lacked diffractaic acid (= chrysophthalma unknown). Tønsberg (1994) described *C. flavovirens* as the sorediate counterpart to *C. chrysophthalma* (P. James) P. James & J.R. Laundon. The species differs from *C. candelaris* (L.) J.R. Laundon, with which it has previously been confused in the region, by the presence of rhizocarpic acid and by the finer soredia. Previous reports of *C. candelaris* from the region need to be verified, especially those occuring on *Chamaecyparis*.

Cladonia arbuscula (Wallr.) Flot. – AHF: *1762;* BNIII: *437*; PVCN: *Harris 43763*.

Cladonia atlantica A. Evans – AHF: *1715;* AS: *4301*; BSI: *3261, 3270, 3302* (UV-); CB: *Harris 43791;* PVCW: *3268*; PVCN: *Harris 43765, Harris 43766, Harris 43767;* SB: *3531*.

Some specimens of *C. atlantica* are not UV+ blue/white, despite the presence of baeomycesic and squamatic acids. Such specimens can be confused with C. *floridana* Vainio, which contains thamnolic acid.

Cladonia beaumontii (Tuck.) Vainio – BNI: *3388, 3389*; QB: *4182, 4183*; SWBAT: *3980*.

Cladonia brevis (Sandst.) Sandst. – PVCN: *Harris 43769, Harris 43801.*
Cladonia caespiticia (Pers.) Flörke – BSI: *3244, 3247.*
Cladonia coniocraea (Flörke) Spreng. – BNI: *3208.*
Cladonia conista A. Evans – SWBAT: *5462.*
Cladonia cristatella Tuck. – A: *383;* AHF: *1718.*
Cladonia cryptochlorophaea Asah. – PVC: *3209.*
Cladonia cylindrica (A. Evans) A. Evans – BNI: *3198*; BSIII: *3473, 3476.*
Cladonia didyma (Fée) Vainio - BSIII: *3470*; QB: *Harris 43805.*
Cladonia dimorphoclada Robbins – BNIII: *440*; PVCN: *Harris 53770, Harris 43771.*
Cladonia diversa Asperges – AHF: *1759;* PVCN: *Harris 43802.*

The name *Cladonia diversa* does not presently appear on the North American checklist (Esslinger 2005). The species is separated from *C. pleurota* (Flörke) Schaer., on the basis of having microsquamulose podetia instead of sorediate podetia. All material from southern New Jersey seems to be referrable to *C. diversa.*

Cladonia floerkeana (Fr.) Flörke – BNIII: *3467 ?*; PVCN: *Harris 53772.*
Cladonia floridana Vainio – A: *431, 4184.*
Cladonia grayi G. Merr. *ex* Sandst. – A: *488;* AHF: *1719;* BNI: *3204, 3210, 3382*; BSI: *3266*; HFI: *3529, 3535;* PVC: *3385*; PVCN: *Harris 43773.*
Cladonia incrassata Flörke – AHF: *1720, 1731;* BSI: *3281;* PVCN: *3267*; QB: *Harris 16442, Harris 43812, Harris 43813.*
Cladonia macilenta Hoffm. – AHF: *1716;* AQB: *980, 981;* BNI: *3217, 3386*; BNII: *3526;* BSI: *3269, 3303;* BSII: *3383;* PVCN: *Harris 43768;* PVCW: *3282*; SB: *3534.*
Cladonia ochrochlora Flörke – BNI: *3214*; BNII: *3339*; BSII: *3340*; BSIII: *3525;* PVCN: *3341, 3342*; QB: *Harris 43823;* SB: *3536.*
Cladonia parasitica (Hoffm.) Hoffm. – BNI: *3211, 3390*; PVCN: *3307, 3387*; QB: *4181.*
Cladonia peziziformis (With.) J.R. Laundon – BNI: *3216*; HFI: *3537.*
Cladonia ramulosa (With.) J.R. Laundon – A: *431.*
Cladonia rangiferina (L.) Wigg. – PVCN: *3314.*
Cladonia rappii A. Evans – A: *386;* BNI: *3205*; PVCN: *Harris 43781*; QB: *Harris 43804, Harris 43816.*
Cladonia ravenelii Tuck. – QB: *Harris 43828* (lacking didymic acid).
Cladonia rei Schaer. – BNI: *3213.*
Cladonia santensis Tuck. – PVCN: *Harris 43782;* QB: *Harris 16450, Harris 43809.*
Cladonia sobolescens Nyl. – A: *4344;* PVC: *3311*; PVCN: *Harris 43800.*
Cladonia strepsilis (Ach.) Grognot – A: *4163.*
Cladonia submitis A. Evans – A: *432;* AS: *4280;* BSI: *3265*; SB: *3530.*
Cladonia subtenuis (Abbayes) Mattick – A: *385;* AHF: *1763;* AS: *4346;* BNI: *3207;* BSI: *3264;* PVCN: *Harris 43764;* PVCW: *3262, 3263*; SB: *3529, 3538.*
Cladonia uncialis (L.) Wigg. – A: *384;* AHF: *1763;* BSI: *3260*; HFI: *3533*; PVCN: *Harris 43784*; QB: *Harris 43820.*
Clypeococcum hypocenomycis D. Hawks.* (on *Hypocenomyce scalaris*) – PVCN: *Harris 43790.*
Coenogonium pineti (Ach.) Lücking & Lumbsch – A: *4342*

The combination of *Dimerella pineti* into *Coenogonium* can be found in Lücking et al. (2004).

Collema subflaccidum Degel. – PVC: *3157.*
Dimerella pineti (Ach.) Vězda = *Coenogonium pineti* (Acharius) Lücking & Lumbsch
Diploschistes muscorum (Scop.) R. Sant.* (on *Cladonia*) – PVC: *3299*; PVCN: *3327.*
Endocarpon spp. – AHF: *1762, 1805;* PVC: *3274.*
Flavoparmelia caperata (L.) Hale – AQB: *965;* BNII: *3344;* BNIII: *442;* BSI: *3249*; CB: *Harris 43792;* QB: *655.*
Fuscidea arboricola Coppins & Tønsberg – PVCN: *2663.*
Gyalideopsis sp. – QB: *Harris 16444*; SL: *Buck 36785, Buck 36786.*
Hertelidea pseudobotryosa R.C. Harris, Ladd, & Printzen – PVCN: *3234, 3329.*

This recently described species was first reported from New Jersey by Lendemer (2004) from a locality in Cumberland County, New Jersey. The above collections indicate that the species is likely more common than previously thought, and further collections should be sought. It occurs primarily on rotting burnt logs and tree stumps, as well as more rarely on the bark of living pitch pines.

Heterodermia hypoleuca (Ach.) Trev. – A: *Harris 16434.*
Heterodermia granulifera (Ach.) Culb. – SWBAT: *3906.*
Heterodermia obscurata (Nyl.) Trev. – A: *Harris 16428, Brako 4903;* AHF: *1728;* B: *3460;* BNI: *3155, 3176*; BSI: *3252*; HFI: *3512*; SWBAT: *1443.*
Heterodermia speciosa (Ach.) Trev. – A: *836*; AR: *4291;* BSI: *3256*; QB: *953*; SWBAT: *1443.*
Hypocenomyce anthracophila (Nyl.) P. James & G. Schneid. – BNI: *3199;* BNIII: *3466*; QB: *648.*
Hypocenomyce friesii (Ach.) P. James & G. Schneid. – PVC: *4166;* QB: *647.*
Hypocenomyce scalaris (Fr.) M. Choisy – BSIII: *3471*; HFI: *3501;* PVCN: *Harris 43803.*
Hypogymnia physodes (L.) Nyl. – BNI: *3189*; CB: *Harris 43793;* HFI: *3489.*
Hypotrachyna livida (Taylor) Hale – PVC: *3229*; PVCN: *3332, 3333, 3334*; QB: *646.*
Hypotrachyna osseoalba (Vain.) Park & Hale – BNI: *3160*; QB: *645, 964, 969.*
The above reports of *H. osseoalba* are particularly noteworthy as documentation of the northern extent of the range of this species.
Hypotrachyna showmanii Hale – QB: *961.*
See Lendemer & Harris (2006, this volume) for a discussion of this species and its status in eastern North America. The species is widespread in eastern North America, and is distinguished from other pustulose species of *Hypotrachyna* and *Parmelinopsis* by the production of esorediate pustules, presence of maculae on the lobe tips, and C+ pink chemistry (gyrophoric acid + hiascic acid complex including 5-*O*-methlyhiascic acid).
Imshaugia aleurites (Ach.) S.F. Meyer – AHF: *1737;* BNIII: *3463;* BSI: *3248*; HFI: *3519*; PVCN: *Harris 43785;* QB: *Harris 16453;* QBW: *854.*
Imshaugia placorodia (Ach.) S.F. Meyer – AHF: *1733;* HFI: *3520*; PVCN: *Harris 43786.*
Julella fallaciosa (Arn.) R.C. Harris – BSIII: *3483;* PVC: *3350;* PVCN: *3257.*
Lecanora sp. 1 – BSI: *3226.*
Lecanora sp. 2 – BSI: *3259*; BSIII: *3446.*
Initially the above collections were referred to *Lecanora ramulicola* (H. Magn.) P. May & Printzen, which resembles *L. symmicta.* The material is similar in some respects to *L. minutella* however does not seem to represent that species. *Lendemer 3259* was distributed in *Lich. East. N. Amer. Exs.*, as *Lecanora* sp.
Lecanora sp. 3 (TLC: atranorin, chloroatranorin, caperatic acid?) – BNI: *3183;* BNII: *3366;* BSI: *3230;* BSIII: *3488*; PVCN: *3241*; PVCW: *3240.*
It seems likely that the above material (and a number of additional similar collections) would have been called *Lecanora impudens* Degel., based purely on the presence of atranorin and excavate soralia. The material was loaned to I.M. Brodo, who noted some similarity to *L. farinaria* Borrer, a species that contains roccellic acid. Two collections are fertile (*3240, 3241*) and their apothecia do not match *L. impudens.*
Lecanora cupressi Tuck. – SWBAT: *3903.*
Lecanora dispersa (Pers.) Sommerf. – AHF: *1753, 1754;* PVC: *3312, 3313.*
Lecanora hybocarpa (Tuck.) Brodo – A: *Harris 16416;* BNII: *3364;* GBC: *4336;* PVC: *3348;* QB: *Brako 4915;* SWBAT: *1487;* W: *1007.*
Lecanora minutella Nyl. – BNIII: *434;* SB: *3518* (lignicolous); SL: *Buck 36783.*
Lecanora strobilina (Spreng.) Kieff. – AHF: *1755;* BNI: *3197, 3224*; PVC: *3347*; SB: *3497.*
Lecanora subpallens Zahlbr. – BNI: *3194*; QB: *Brako 4914, Harris 43814;* PVCN: *Buck 36766;* SWBAT: *1478.*
Lecanora thysanophora R.C. Harris – BNI: *3190*; BSI: *3236*; BSIII: *3456;* PVCN: *3317*; SB: *3496*; SWBAT: *1608.*
Lecidea nylanderi (Anzi) Th. Fr. – PVCN: *3271.*
Lecidea plebeja Nyl. – AHF: *1723*; SL: *Buck 36790.*
Lepraria caesiella R.C. Harris – A: *Harris 16409, Harris 16410;* BNI: *3175, 3181, 3184;* HFI: *3521, 3522;* PVCN: *3355;* PVCW: *3285;* QB: *Harris 16451, Harris 43825;* SB: *3509.*
This recently described species (Lendemer 2005) had previously been reported as *Lepraria* sp. by Harris (1985) and was called "an apparently unnamed *Lepraria*" in Brodo et al. (2001).
Lepraria elobata Tønsberg – BNI: *3179, 3187;* BNIII: *3468;* PVCN: *3326*; SWBAT: *3968.*
This species could be confused with *L. lobificans* with respect to chemistry, but differs in having a thinner/dispersed blue-gray thallus that lacks the medulla and lobes indicative of *L. lobificans.*
Lepraria aff. *incana* (L.) Ach. – PVCN: *3357, 3358*; SB: *3506, 3524*; SWBAT: *3992.*

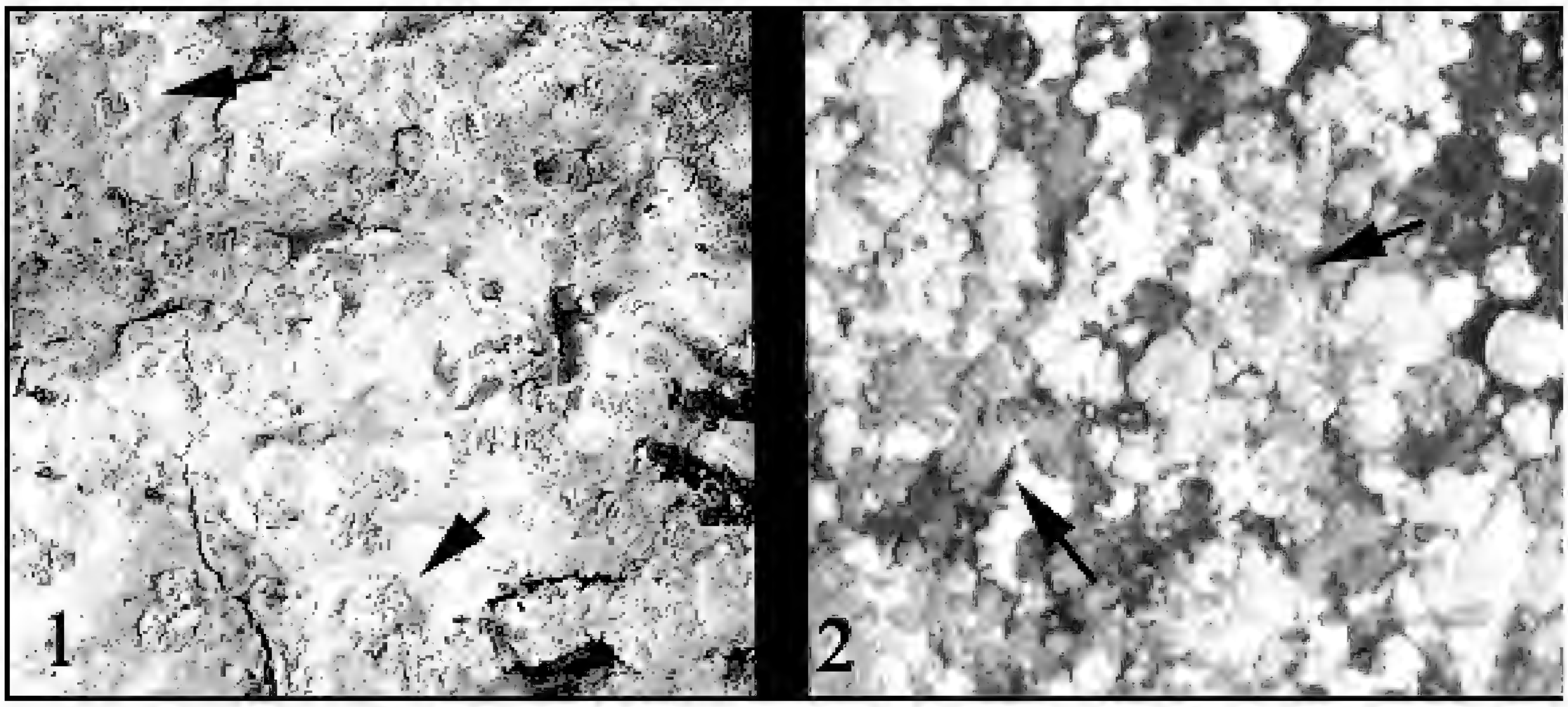

Plate 1. Fig. 1. Nadvornikia sorediata, Lendemer 3349, arrows indicate punctiform soralia. *Fig. 2. Trapelia sp., Lendemer 3279,* arrows indicate sorediate portions of areoles.

Lepraria lobificans Nyl. – AHF: 1735, 1744, 1801, 1745; BNI: 3174, 3377; BSI: 3295; BSII: 3378; BSIII: 3457; HFI: 3539; PVCN: 3288, 3376; SWBAT: 3919.

Leptogium cyanescens (Rabenh.) Körber – BSIII: *3447, 3453;* PVC: *3156*; QB: *4162.*

Lobaria quercizans Michx. – PVC: *4273.*

Loxospora pustulata (Brodo & Culb.) R.C. Harris – A: *Harris 16427;* AHF: *1732, 1740;* AQB: *958;* BNI: *3180, 4277* (fertile); BNII: *3365;* BSI: *3254;* BSIII: *3472, 3487* (fertile)*;* PVCN: *3374* (fertile)*;* PVCW: *3280* (fertile); QB: *658, 959;* SB: *3490, 3499*; SWBAT: *3915.*.

The above collections marked "fertile" have poorly to well developed ascomata, but all of the asci examined were sterile. The material is currently under study to determine the correct placement of the species. The taxon has previously been reported from the region as *Haematomma* sp. (Harris 1985).

Melanelixia subaurifera (Nyl.) Blanco et al. – CB: *Harris 43794.*

Micarea erratica (Körber) Hertel et al. – PVC: *3308.*

Micarea globulosella (Nyl.) Coppins – BSI: *3300.*

Micarea melaena (Nyl.) Hedl. – BNI: *3196*; BNII: *3325, 3330;* HFI: *3550;* PVCN: *3237*; SL: *Buck 36781.*

Micarea peliocarpa (Anzi) Coppins & R. Sant. – CB: *Harris 43795*; PVCN: *Buck 36763*; QB: *4164;* SL: *Buck 36782, Buck 36789.*

Micarea prasina Fr. *s. lat.* – BNI: *3222;* PVCN: *2653*; SL: *Buck 36780.*

Mycoblastus fucatus (Stirt,) Zahlbr. ? – BSIII: *3484.*

Mycocalicium subtile (Pers.) Szatala – BSI: *3228, 3231, 3258*; PVCN: *3232*; QB: *4161;'* SB: *3502, 3503, 3504.*

Myelochroa aurulenta (Tuck.) Elix & Hale – BNI: *3161*; BNII: *3338;* SWBAT: *1442, 3907.*

Nadvornikia sorediata R.C. Harris – A: *4343;* BSIII: *3448;* PVC: *3349*; SB: *3494.*

Ochrolechia arborea (Kreyer) Almb. – SB: *3491;* PVC: *3151.*

Ochrolechia pseudopallescens Brodo – A: *494;* BNII: *3337;* BSI: *3251, 3255;* BSIII: *3482;* PVC: *3221*; PVCN: *3238*; QB: *Brako 4919;* SB: *3510.*

Opegrapha vulgata Ach. – AR: *4278;* BNI: *3154*; BSIII: *3455*; GBC: *4335.*

Parmelia squarrosa Hale – A: *Harris 16419;* AHF: *1734;* BNI: *3170, 3202*; BSI: *3296*; BSII: *3332*; BSIII: *3479;* PVCN: *3373* (fertile); QB: *Harris 43815.*

Several of the above collections (*3332, 3373, 3479*) are referred here with some hesitation. The thalli of these collections are distinctly pruinose, especially at the lobe tips, and the isidia are somewhat isidio-sorediate. The material may represent the European isidio-sorediate species *P. ernstiae* Feuerer & Thell. Presently this is impossible to determine, however, since the authors of that species did not describe the rhizines (Feuerer & Thell 2002). Hale (1971) noted that some specimens of *P. squarrosa* are pruinose and it seems further study is clearly needed.

Parmelia sulcata Taylor – BNIII: *441*; CB: *Harris 43796.*

Parmelinopsis horrescens (Taylor) Elix & Hale – QB: *986p.p.*

Parmelinopsis minarum (Vain.) Elix & Hale – AR: *4274;* AS: *4337;* BNI: *3192, 3195;* BNII: *3370* (fertile); BSIII: *3458;* PVC: *3147*; QB: *968p.p.*

Parmeliopsis subambigua Gyelnik – BSI: *3297;* PVC: *3289*; PVCN: *3369*; QB: *657.*

Parmotrema hypoleucinum (J. Stein.) Hale – PVC: *3310.*

Parmotrema hypotropum (Nyl.) Hale – AHF: *1721, 1729, 1730;* BNI: *3172*; BNIII: *373;* BSI: *3291, 3292*; HFI: *3548;* PVCN: *3381*; SWBAT: *3917;* QB: *Harris 43819.*

Parmotrema perforatum (Jacq.) A. Massal. – QB: *Harris 43818.*

Parmotrema reticulatum (Taylor) M. Choisy – BNI: *3168, 3203*; PVCN: *3239*; QB: *Harris 43822.*

Parmotrema subisidiosum (Müll. Arg.) M. Choisy – AQB: *960;* BNI: *3164;* BNII: *3527;* GBC: *5294.*

These records are apparently the first of this species from New Jersey.

Peltigera didactyla (With.) J.R. Laundon – PVC: *3315* (apotheciate).

This is the first report for this species from New Jersey.

Pertusaria amara (Ach.) Nyl. – AHF: *1760, 1761.*

Pertusaria macounii (Lamb) Dibben – QB: *Brako 4921.*

Pertusaria ophthalmiza (Nyl.) Nyl. – B: *3680;* GBC: *4300*; PVC: *3316.*

Pertusaria paratuberculifera Dibben – A: *Harris 16432, Harris 16433*; BNI: *3220*; BSIII: *3450;* PVC: *3219*; QB: *649, 966;* SB: *3498*; SWBAT: *3916.*

Pertusaria pustulata (Ach.) Duby – AHF: *1757*; PVCN: *Buck 36764.*

Pertusaria trachythallina Erichsen – A: *Harris 16422.*

Pertusaria velata (Turner) Nyl. – BSI: *3278;* BSIII*: 3681*; GBC: *4279.*

Phaeocalicium polyporaeum (Nyl.) Tibell – A: *Buck 8964*; QB: *4160.*

Phaeographis inusta (Ach.) Müll. Arg. – QB: *Buck 36800.*

Phaeophyscia adiastola (Essl.) Essl. – AHF: *1747, 1756;* PVC: *3146.*

Phaeophyscia hirsuta (Mereschk.) Essl. – PVC: *3351, 3352, 3352.*

The synonymy (Esslinger, 2004) of *Phaeophyscia cernohorskyi* (Nàdv.) Essl., with *P. hirsuta* is followed here. As a result, *P. hirsuta* is here reported for the first time for New Jersey.

Phaeophyscia rubropulchra Degel. – A: *4338;* AHF: *1738;* BNI: *3185;* BSI: *3253;* BSII: *3322;* BSIII: *3452, 34697;* PVCW: *3233*; SWBAT: *1441;* W: *1000, 1001, 1002.*

Physcia adscendens (Fr.) H. Olivier – PVC: *3149.*

Physcia americana G. Merr. – A: *Harris 16418;* BNII: *3343*; BSII: *3367*; SWBAT: *3908, 3918*(?).

Lendemer 3918 is abnormal in having developed pustule-like lumps.

Physcia millegrana Degel. – A: *Brako 4906;* AHF: *1739;* BNI: *3162;* PVC: *3148.*

Physcia pumilior R.C. Harris – BSI: *3301;* BSIII: *3481.*

The presence of this southern species is not unexpected, since it was recently also collected farther north in the Delaware Water Gap of Pennsylvania. The report of this species from the Water Gap was inadvertently omitted from Harris & Lendemer (2005). This is the first report of the species from New Jersey. Further collections should be sought to document the northern range limits of the species.

Physciella chloantha (Ach.) Essl. – AHF: *1746, 1748.*

Physconia leucoleiptes (Tuck.) Essl. – B: *3461;* PVC: *3169, 3218.*

All of the above collections are C- and thus belong to *Physconia leucoleiptes s. str.* (i.e. not including *P. kurokawae* Kashiw.).

Placidium arboreum (Schw. *ex* Michener) Lendemer – BSIII: *3478.*

Though historically reported, this is the first modern collection of *P. arboreum* from the region. See discussion in Lendemer and Yahr (2004).

Placynthiella dasaea (Stirton) Tønsberg – BSIII: *3480;* HFI: *3515, 3516;* QB: *Buck 36806;* SL: *Buck 36784.*

Placynthiella icmalea (Ach.) Coppins & P. James ? – BNI: *3215*; BSI: *3305*; SB: *3505.*

Placynthiella oligotropha (J.R. Laundon) Coppins & P. James – A: *Harris 16421p.p.;* AQB: *979;* PVC: *3298.*

Placynthiella uliginosa (Ach.) Coppins & P. James – A: *Harris 16421p.p.*; PVCN: *Harris 43788*; SL: *Harris 36791.*

Placynthium nigrum (Huds.) S.F. Gray – GBC: *4282;* PVC: *3144.*

Pseudosagedia rhaphidosperma (Müll. Arg.) R.C. Harris – GBC: *4334.*

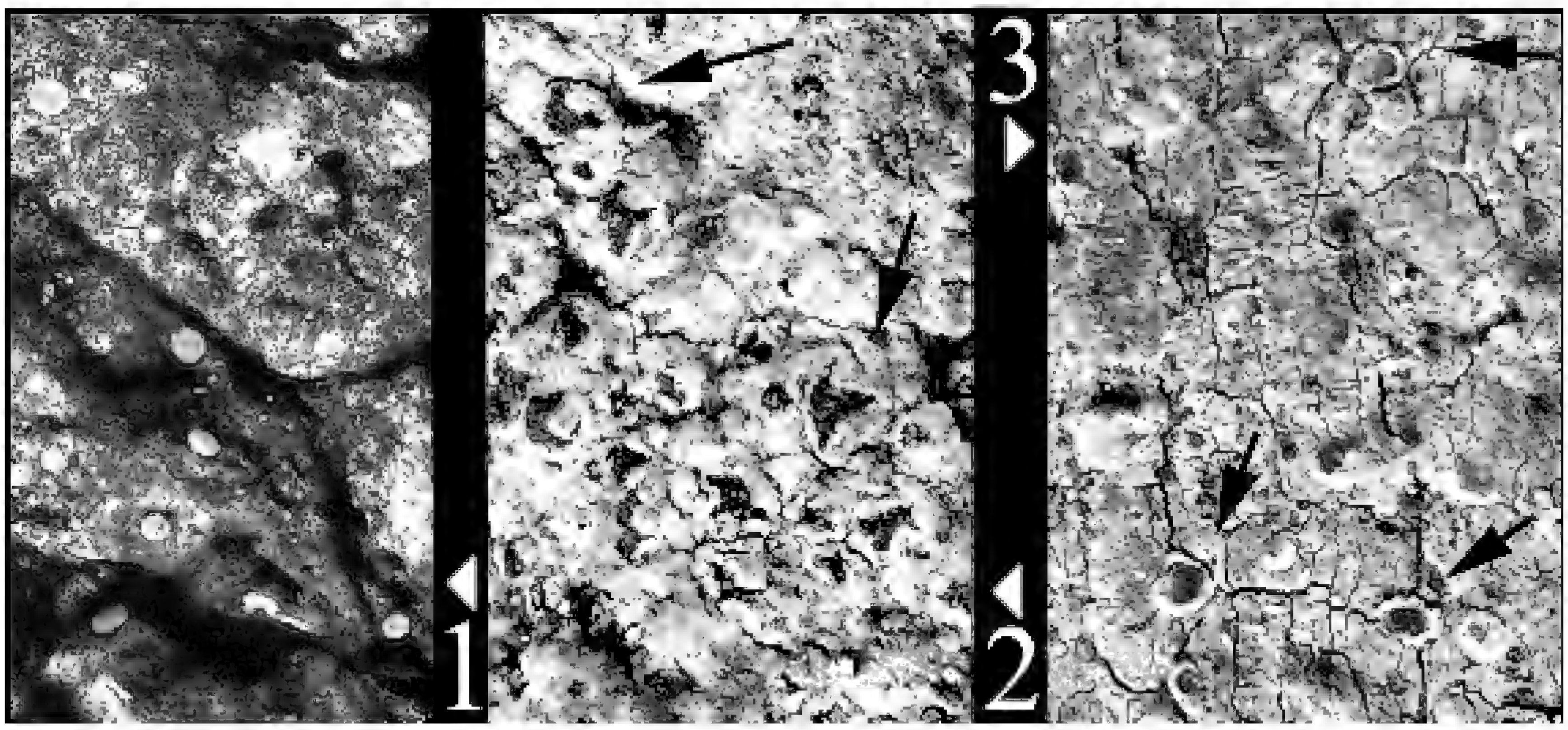

Plate 3. Fig. 1. Sarea resinae, Lendemer 3507. Fig. 2. Schismatomma pericleum, Lendemer 3372, thallus with emergent apothecia, arrows indicate apothecia. *Fig. 3. Schismatomma glaucescens, Lendemer 4165,* thallus with emergent apothecia, arrows indicate fully exposed apothecia.

Psoroglaena dictyospora (Orange) Harada – SWBAT: *3901.*

This species has previously been referred to as *Macentina dictyospora* Orange (Orange, 1991). The transfer to *Psoroglaena* was made by Harada (2003) but does not appear in Esslinger (2005). This is the first report for New Jersey.

Punctelia rudecta (Ach.) Krog – AHF: *1742, 1743;* AQB: *951, 952;* BNI: *3163, 3171;* BNII: *3319;* BSI: *3276;* HFI: *3511;* PVC: *3152*; SB: *3549.*

Punctelia subrudecta auct. Amer. – A: *Harris 16417;* AHF: *1741;* BNI: *3165*; BNIII: *3462, 3464;* BSI: *3245*; CB: *Harris 43797;* HFI: *3540A, 3540B, 3541, 3542A, 3542B, 3543, 3544*; QB: *656.*

Some of the above collections (e.g. *Lendemer 3464*) are superficially similar to *P. missouriensis* Wilhelm & Ladd in having lobulate soredia in the older soralia. However, they seem best placed in *P. subrudecta*, as the younger soralia are typical of *P. subrudecta* in having numerous soredia.

Pycnothelia papillaria Dufour – BNI: *3206*; BNIII: *446*; PVCN: *Harris 43789.*

Pyrenula pseudobufonia (Rehm) R.C. Harris – W: *999.*

Pyrrhospora varians (Ach.) R.C. Harris – PVCN: *990.*

Pyxine sorediata (Ach.) Mont. – A: *Harris 16437;* B: *3465;* BNI: *3166, 3182*; BSIII: *3451*; GBC: *5293;* QB: *653, 955*; SWBAT: *3913*; W: *1003.*

Pyxine subcinerea Stirt. – BNI: *3167*; BSIII: *3454.*

Rhizocarpon reductum Th. Fr. – PVC: *3346.*

Rinodina maculans Müll. Arg. – BNI: *3186*; W: *1006.*

Rinodina subminuta H. Magn. – SWBAT: *1483.*

Ropalospora chlorantha (Tuck.) S. Ekman – QB: *Brako 4908.*

Sarcogyne regularis Körber – AHF: *1726, 1751;* SB: *3523.*

Sarea resinae (Fr.) Kuntze – BNI: *3193*; SB: *3507.*

This species has not previously been reported from New Jersey. Additional collections should be sought, as it is likely more common than the few collections cited here indicate. It is found on the sap of shaded pine trees in open oak-dominated pine-oak forests and is not lichenized.

Schismatomma glauscescens (Nyl. *ex* Willey) R.C. Harris – QB: *4165.*

Schismatomma pericleum (Ach.) Branth & Rostrup – PVCN: *3225, 3372.*

This taxon is easily overlooked in the field, and was only noticed after an accidental collection with *Julella fallaciosa*. The species is known from only a few records in North America and is reported here as new to New Jersey.

Scoliciosporum chlorococcum (Stenh.) Vězda – A: *Harris 16429.*

Segestria leptalea (Durieu & Mont.) R.C. Harris – QB: *Buck 36810.*

Stereocaulon glaucescens Tuck. – PVC: *3309.*

Strigula americana R.C. Harris – GBC: *4287.*

Trapelia sp. – PVC: *3279.*

The above collection is characterized by a saxicolous C+ pink thallus composed of dispersed to somewhat continuous gray areoles with a phenocortex, and poorly defined ± excavate soralia with coarse gray soredia. Some forms of *Trapelia glebulosa* (Sm.) J.R. Laundon are superficially similar, but that species is esorediate. *Trapelia placodioides* Coppins & P. James, a common saxicolous sorediate species differs primarily in having a thick continuous placodioid thallus.

Trapelia glebulosa (Sm.) J.R. Laundon – PVC: *3243.*

Trapelia glebulosa is the oldest name for *T. involuta* (Taylor) Hertel, following Laundon (2005).

Trapelia placodioides Coppins & P. James – AR: *4289.*

Trapeliopsis sp. ? – BNII: *3359.*

The above collection is sterile and tentatively assigned to *Trapeliopsis*. It consists of a gray areolate thallus that reacts C+ red (strongly), with large hemispherical soralia and fine soredia, and was collected on a rotting pine tree.

Trapeliopsis flexuosa (Fr.) Coppins & P. James – A: *956;* BSI: *3250*; PVCN: *3318, 3324, 3331* (fertile); SB: *3500* (fertile).

Tuckermanella fendleri (Tuck.) Essl. – AHF: *1736;* PVCN: *3304.*

Tuckermanopsis americana (Spreng.) Hale – BNI: *3379;* BSI: *3277, 3287*; PVCN: *3273, 3275.*

Tuckermanopsis ciliaris (Ach.) Gyelnik – QB: *Brako 4920.*

Usnea mutabilis Stirt. – BNI: *3384.*

Usnea pensylvanica Motyka – BNI: *3212.*

Usnea strigosa (Ach.) A. Eaton – BH: *4298, 4299;* BSI: *3290.*

Usnea trichodea Ach. – QB: *650.*

Verrucaria sp. – BSII: *3320, 3321.*

Verrucaria muralis Ach. – HFI: *3495.*

Vezdaea leprosa (P. James) Vězda – AR: *4275, 4285.*

This is the first report of *Vezdaea leprosa* from the state. Due to its inconspicuous nature, the species is easily overlooked in the field. In southern New Jersey is has been found growing at the bases of trees along roads and over bryophytes growing on ruined stone walls.

Vulpicida viridis (Schw. *ex* Halsey) J.E. Matteson & Lai – QB: *652.*

Xanthoparmelia conspersa (Ehrh. *ex* Ach.) Hale – PVC: *3345.*

Lichenicole sp. 1 – BSI: *3246;* PVC: *3153*; SB: *3492* (on *Punctelia subrudecta*).

This species resembles a species of *Tremella* and is discussed further by Harris & Lendemer (2005)

Sterile sorediate crust 3284 (TLC: no lichen substances) – PVCW: *3284.*

Sterile sorediate crust 3459 (TLC: atranorin) – B: *3459,* BNI: *3177;* BSI: *3283;* SB: *3508.*

Sterile sorediate crust 3335 (TLC: atranorin, chloroatranorin) – BNII: *3335.*

Sterile sorediate crust 3354 (TLC: atranorin, chloroatranorin, caperatic acid?, protocetraric acid?) – PVC: *3354,* PVCW: *3306.*

Sterile sorediate crust 3356 (TLC: atranorin, chloroatranorin, caperatic acid?) – PVCN: *3356.*

The above material is morphologically similar to *sterile sorediate crust 3354* but lacks protocetraric acid.

Sterile sorediate crust 4339 (TLC: atranorin, norstictic acid, stictic acid, constictic acid, connorstictic acid). – A: *4339*.

Sterile sorediate crust 4420 (TLC: atranorin, zeorin, stictic acid, constictic acid, norstictic acid (tr.), connorstictic acid (tr.). – SWBAT: *4420.*

Sterile sorediate crust 4424 (TLC: atranorin, zeorin). – SWBAT: *4424.*

Sterile sorediate crust 2658 (TLC: fumarprotocetraric acid) – PVCN: *2658*

Sterile sorediate crust 3967 (TLC: perlatolic acid unknown) – SWBAT: *3967.*

Sterile sorediate crust 3477 (TLC: unknowns) – BSIII: *3477*

Sterile sorediate crust 3201 (TLC: unknown) – BNI: *3201.*

DISCUSSION

Phytogeography

This study is one of a very few dealing with coastal plain lichens. For this reason, despite the preliminary nature of this checklist, it is important to attempt to place the lichen flora of southern New Jersey into the larger geographic context of eastern North America. Brodo's (1968) lichen flora of Long Island, NY, remains the only comprehensive treatment of the lichens of any portion of the coastal plain of eastern North America. Though the landmark treatments of Harris (1990, 1995) also cover southern areas of the coastal plain, they remain far from complete. Wharton State Forest can, perhaps, be considered an intermediate station between the above.

The lichen flora of the coastal plain in southern New Jersey can essentially be described as one of extremes, since many species have their southernmost *or* northernmost reported occurrence in the region. Perhaps it is more important to note that the number of "northern" species (i.e. those typical of the coastal plain north of Long Island) in the flora is considerably less than the number of species more typical (or described from) the southern coastal plain (i.e. North Carolina, Florida). Only one species, *Cladonia terrae-novae* (Ahti) Ahti, does not occur farther south. In contrast is the number of species that are rare or absent farther north: *Cladonia beaumontii* (Tuck.) Vainio, *Cladonia evansii* Abbayes (see Brodo, 1968), *Cladonia ravenelii* Tuck., *Cladonia santensis* Tuck., *Physica pumilior* R.C. Harris, *Pyxine subcinerea* Stirton, and *Parmotrema subisidiosum* (Müll. Arg.) M. Choisy. Due to the paucity of data surrounding the distributions of crustose lichens in eastern North America, it is nearly impossible to discuss the edge of their ranges with any certainty.

It is also important to consider the differences between the present-day flora and that reported by Austin (1881). Though most of Austin's records come from the town of Closter or the Palisades (both northern New Jersey), it is easily seen that, even when taking into account changes in species concepts and taxonomy, the present list (as well as that of Brodo (1968)) includes many additional taxa. If one excludes the crustose species that would likely have been overlooked by early collectors (with the exception of Austin, who collected relatively few lichens in southern New Jersey), many of the southern taxa present in the flora today were not reported by Austin (1881).

It is tempting to speculate that these species have only recently been introduced to the flora. Two taxa that tend to support this hypothesis are *Physcia pumilior* and *Pyxine subcinerea*. Both of these are conspicuous foliose taxa and are not easily overlooked. *Physcia pumilior* is of particular interest because it was only recently described from the southeastern coastal plain (Harris 1990), at which time it was not known to occur north of Maryland. The species was found to be locally abundant during this study, and was recently reported from northeastern Pennsylvania on the basis of a single small collection (Harris & Lendemer, 2005). If additional records are found farther north in the future, it seems impossible to deny that the range of the species is steadily expanding. *Pyxine subcinerea* was only recently reported from southern New York, and the lack of historical records of this species from that area as well as from southern New Jersey would tend to support another scenario of range expansion.

General Comments

A total of 190 named taxa are reported here from Wharton State Forest. Many of these records arethe first for New Jersey, for the region, or the first modern report of a taxon known only from historical records. A preliminary checklist for the region based on materials held in the Herbarium of the New York Botanical Garden (NY) included 160 named taxa (R.C. Harris, unpublished). The presence of more species in a small portion of southern New Jersey than were previously known from the entire region indicates that the lichen flora of the region as a whole is likely much more species-rich than previously thought. The flora of Wharton State Forest is likely representative for the region as a whole since nearly every regional habitat is present there. (Species confined to coastal areas are one exception.) The flora of Long Island is vegetationally similar to that of this area. It is interesting, though, that that flora reported ~260 species from an area of 1401 square miles versus that of the present study which reports ~190 species from a significantly smaller area.

A classification of the species based on primary substrate (appendix II) reveals that many taxa fall into several broad ecological groups. With respect to substrate preference, the majority of corticolous species occur on hardwoods, especially *Acer* and *Quercus*. Some taxa show a preference for a specific type

of hardwood, such as *Acrocordia megalospora* for *Quercus,* while others do not. Several species are apparently confined to the bark or lignum of *Pinus,* including *Imshaugia* spp., *Hertelidea pseudobotryosa,* and *Tuckermanella fendleri*. In southern New Jersey the non-lichenized calicioid fungi *Chaenothecopsis savonica* and *Mycocalicium subtile* occur on the wood of *Pinus* and *Quercus,* respectively. Several species are also apparently confined to *Chamaecyparis thyoides,* including *Chaenotheca hygrophila* and *Chrysothrix flavovirens*. The species known only from saxicolous substrates likely represent recent additions to the flora, since the arrival significant amounts of rock (especially concrete) is a recent phenomenon. The placement of species into broader groups defined by forest type and composition essentially parallels the occurance of their substrates. Exceptions are found in trees planted by humans in unlikely places, for instance *Chamaecyparis thyoides* occuring in upland sandy areas and *Acer* planted around now abandoned habitation sites. Similarly human-introduced stands of *Juniperus virginiana* and *Malus* often host unexpected or ecologically aberrant assemblages of lichen species.

The treatment of several taxonomic groups also requires brief explanation. With respect to the array of unidentified sterile sorediate crusts, it should be noted that the majority likely represent species of *Lecanora,* which are poorly understood and have mostly been ignored, or confused/lumped into *L. impudens* Degel. One group of sorediate specimens is of particular interest, as it may represent an undescribed species of *Lecanora*; several collections were found with well developed apothecia, and the material seems chemically consistent in containing atranorin, chloroatranorin, and caperatic acid(?). In addition to the "taxa" reported here, a number of additional as yet unidentified sterile sorediate crusts that may represent *Lecanora* species also occur in southern New Jersey.

A number of additional problematic non-sorediate *Lecanora* species were also found during this study, including one or more small corticolous/lignicolous species with narrowly ellipsoid ascospores. Clearly, much further study is needed to fully understand and characterize the members of this genus that occur in the region.

Interestingly, though members of the sterile sorediate genus *Lepraria* are common throughout the forest, the genus is not particularly diverse. In fact, only four species were recorded, all of which were widely distributed. An additional species, *Lepraria vouauxii* (Hue) R.C. Harris, though not yet collected in the forest, is also expected to occur. It can also be stated with confidence that *Lepraria lobificans* Nyl. and *L. caesiella* R.C. Harris are the most common species of *Lepraria* in the forest, as they were collected at nearly every locality.

Calicioid fungi (lichenized and non-lichenized) also occur throughout the forest, and are often considered of value in assessing the age and health of a forest (Selva, 1998). Unfortunately, many species are substrate specific and easily overlooked. Though two common species (*Chaenothecopsis savonica* (Räsänen) Tibell and *Mycocalicium subtile* (Pers.) Szatala) were routinely collected during this study, the additional taxa reported from one or two collections made by others were likely overlooked by the author. Thus the lack of records for these species does not necessarily indicate that they are rare in the region. Lack of additional records of *Opegrapha* species is likely also a result of under-collection by the author.

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APPENDIX I

LOCALITY INDEX (ABBREVIATIONS AS USED IN CHECKLIST)

A - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Batsto Natural Area, along the Mullica River, S of Atsion. – Lat. 39° 44' 16"N, Long. 74° 43' 31"W. - Recently burned (ca. 1989) oak-pitch pine (*Pinus rigida*) forest.

AHF - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, from Atsion to Hampton Furnace. – Lat. 39° 45' N, Long. 74° 41' W. - Road through pine – oak forest with extensive ponds and wetlands.

AQB – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Batsto Natural Area, between Atsion and Quaker Bridge, W of Atsion. – Lat. 39° 43' N, Long. 74° 40' W. - Oak-pitch pine (*Pinus rigida*) forest.

AR – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, ca. 1 mile W of Atsion, along Atsion Road. – Lat. 39° 44' 39"N, Long. 74° 44' 25"W. – Rich upland pine (*Pinus rigida*) – oak (*Quercus* spp.) forest with *Ilex* and a sparse understory of *Kalmia* and other ericaceous shrubs.

AS – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, ca. 1 mile S of Atsion, ca. ¼ mile E of NJ Route #206. – Lat. 39° 43' 42"N, Long. 74° 43' 43"W – Pitch pine (*Pinus rigida*) forest burned 20 years ago on sandy soil, with low wet topography.

B – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, margins of Batsto Village. – Lat. 39° 38' 38"N, Long. 74° 39' 12"W. - Open pine (*Pinus rigida*) – oak (*Quercus*) forest.

As a result of the maintenance of Batsto village by the Forest Service, the forest within the immediate vicinity of the village of Batsto is nearly devoid of an understory and more open than usual due to widely spaced trees. These factors, coupled with the presence of stones as a building material, have lead to a diverse lichen community, including species growing in abundance that are rarer in other portions of the forest. Interestingly, only *sterile sorediate crust 3459* appears to be completely restricted to this locality.

BH – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Buttonwood Hill Camping Area, Crowleytown, just N of Pleasant Mills Road. - Lat. 39° 37' 43"N, Long. 74° 37' 05"W – Open sandy area surrounded by overgrown swampy forest dominated by red maple (*Acer rubrum*) and pitch pine (*Pinus rigida*) with sparse *Betula populifolia* and *Quercus*.

BNI – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, 0-1 mile N of Batsto, Batsto Natural Area, along the E shore of the Batsto River. - Lat. 39° 39' 23"N, Long. 74° 39' 01"W. - Mixed pine (*Pinus*) – oak (*Quercus*) forest.

BNII – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, N of Pleasant Mills Road and W of Batsto, E shore of the Mullica River. – Lat. 39° 38' 34"N, Long. 74° 39' 26"W. - Mixed pine (*Pinus rigida*) – oak (*Quercus*) forest grading into cedar (*Chamaecyparis*) swamps.

BNIII - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, W shore of the Batsto River, ca. 0-1 mile N of Batsto. – Lat. 39° 39' 19"N, Long. 74° 39' 22"W. - Dense pine (*Pinus rigida*) – oak (*Quercus*) forest, with many small clearings (dominated by scrub oak) and grassy openings.

Though not particularly diverse in total number of species, the area above Batsto between the Batsto and Mullica Rivers includes extensive populations of *Cladonia* species. The diversity seen directly south and west of Batsto is not paralleled here.

BSI – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, S of Batsto, just W of the shore of the Batsto River and E of the Mullica River. - Lat. 39° 38' 28"N, Long. 74° 39' 04"W. - Low, moist, mixed pine (*Pinus rigida*) – oak (*Quercus*) forest with many small depressions, grading into typical dry pine – oak barrens.

BSII – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, just S of Batsto, on a flat upland area between the Mullica River and the Batsto River. – Lat. 39° 38' 28"N, Long. 74° 39' 12"W. - Upland disturbed pine (*Pinus rigida*) – oak (*Quercus*) forest (oak dominant).

BSIII - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, just S of Batsto, E shore of the Batsto River. – Lat. 39° 38' 30"N, Long. 74° 38' 59"W. - Open oak (*Quercus*) dominated pine (*Pinus rigida*) – oak forest, on a gentle hillside grading into a swampy mixture of Atlantic white cedar (*Chamaecyparis*) – red maple (*Acer rubrum*).

CB – USA. NEW JERSEY. ATLANTIC CO.: Wharton State Forest, NNW of Batsto, Constable Bridge over Mullica River. – Lat. 39° 39' N, Long. 74° 40' W. - Pine-oak scrub and *Chamaecyparis* along river.

GBC – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Green Bank Cemetery. Green Bank. – elev. 10-20 ft. - UTM 18 535636E 4384443N – Lat. 39° 36' 32"N, Long. 74° 35' 06"W – Open cemetery and adjacent upland oak (*Quercus*) forest with a *Kalmia* understory.

HF - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, ca. 3 miles northeast of Atsion, Hampton Furnace. – Lat. 39° 45' 54"N, Long. 74° 41' 16"W. - Large clearing with sparse oaks (*Quercus*) and bordered by an unnamed stream and a pine dominated pine – oak forest.

HFI – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, E of Atsion, 0-1/4 mile N of Hampton Furnace, W shore of Batsto River. - Lat. 39° 46' 22"N, Long. 74° 40' 56"W. - Dense, upland mixed pine (*Pinus rigida*) – oak (*Quercus*) forest.

PVC – USA. NEW JERSEY. ATLANTIC CO.: Pleasant Mills Cemetery, W of Batsto, Batsto Natural Area. – Lat. 39° 38' 30"N, Long. 74° 39' 40"W

Cemeteries are well known for providing stable habitats for cryptograms that are not found elsewhere within a region, and this locality is no exception. Since there is little naturally exposed rock present in the pine barrens of southern New Jersey, abandoned settlements and cemeteries provide the only available substrate for saxicolous lichens. Pleasant Mills Cemetery is the only cemetery within Wharton State Forest that supports a significant (for the region) diversity of saxicolous taxa, several of which are typical of calcium-rich substrates. The presence of such species (including *Agonimia opuntiella* (Buschardt & Poelt) Vězda, *Caloplaca subsoluta* (Nyl.) Zahlbr., and *Phaeophyscia hirsuta* (Mereschk.) Essl.) only at this locality leads to the question of how such taxa were able to colonize an area so distant from other populations (or possible sources of substrate). The fact that many of the gravestones were clearly brought to the locality from elsewhere indicates one possible method of travel for some of the species. Since several species produce soredia or blastidia it is also possible they were wind-dispersed.

Interestingly, a sorediate species of *Trapelia* found on siliceous rocks at Batsto Village does not seem to occur at Pleasant Mills despite the fact that the localities are only a short distance apart. The siliceous rocks at Batsto were brought from elsewhere and are not the same as those found at Pleasant Mills (which are mostly calcareous).

PVCN – USA. NEW JERSEY. ATLANTIC CO.: Wharton State Forest, E of Nesco, NW of Batsto, N of Pleasant Mills Cemetery. - Lat. 39° 38' 46"N, Long. 74° 39' 52" W. - Mixed pine (*Pinus rigida*) – oak (*Quercus*) forest with sparse birch (*Betula populifolia*) and maple (*Acer*).

PVCW – USA. NEW JERSEY. ATLANTIC CO.: Wharton State Forest, E of Nesco, W of Batsto, NW of Pleasant Mills Cemetery, part of the Mullica River system. – Lat. 39° 38' 32"N, Long. 74° 39' 44"W. – Swampy mixed pine (*Pinus*) – oak (*Quercus*) forest overgrown with *Smilax*, and with large swampy depressions with maple (*Acer*) and cedar (*Chamaecyparis*).

QB - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Batsto Natural Area, E shore of Batsto River, ½ mile N of Quaker Bridge. – Lat. 39° 42' 35"N, Long. 74° 39' 59"W. - Cedar swamp.

Quaker Bridge is a well known historical locality of particular importance because it produced the type material of *Arthonia quintaria* Nyl.[2], a species that has not been found there since. The extensive cedar swamp with many clearings created by fallen trees is apparently a refuge for a number of species that are clearly rare throughout the forest. In addition to the only record of *Parmelinopsis horrescens* (Taylor) Elix & Hale, a small population of *Usnea trichodea* Acharius was found there, a species the author had previously considered extirpated.

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[2] *Arthonia quintaria* Nyl. is easily recognized by the thin white thallus, irregular ascomata, 3-7 septate ascospores ca. 20 x 8µm, and lack of a photobiont. Although specimens of the species are often sterile, a recent (fertile) collection from the region is reported here:

USA. NEW JERSEY. CAPE MAY CO.: 1.6 miles southeast of Swain, ca. 0.8 miles north of Holmes Creek, Reubens Wharf, Lat. 39° 06' 17"N, Long. 74° 47' 38"W, coastal swamp of maple (*Acer*), *Liquidambar*, black oak (*Quercus*) and abundant holly (*Ilex opaca*), on branches of *Ilex opaca, J.C. Lendemer et al. 4405* (NY!, PH-hbL!, UCR!).

QBW - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Batsto Natural Area, NW of Quaker Bridge. - Lat. 39° 42' N, Long. 74° 40' W. - Oak-pitch pine (*Pinus rigida*) barrens, pitch pine dominant.

SB – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, ca. 2.5 miles NE of Hampton Furnace, N of Carranza Memorial, W shore of the Skit Branch of the Batsto River. - Lat. 39° 47' 10"N, Long. 74° 39' 34"W. - Oak (*Quercus*) dominated, moist, pine (*Pinus rigida*) – oak forest, with many small sunny openings and sparse ericaceous understory.

The Skit Branch of the Batsto River is considered by many to be the most pristine of the tributaries to the Batsto River, since its headwaters and entire course are within the boundaries of the forest (A.E. Schuyler, pers. comm.). The lichen diversity found at this locality mirrored that of some of the areas south of Batsto, and further study would likely reveal a number of additional species.

SL – USA. NEW JERSEY. ATLANTIC CO.: Wharton State Forest, Batsto Natural Area, Sleeper Branch of Mullica River. - Lat. 39° 39' N, Long. 74° 40' W. - *Pinus rigida* barrens and *Chamaecyparis* swamp.

SWBAT - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Sweetwater, SE of Batsto, along the N bank of the Mullica River. - Lat. 39° 37' N, Long. 74° 38' W. - Mixed pine-oak forest with stand of *Juniperus.*

The forest at this locality is highly disturbed and portions of it have clearly been cleared for use in the past. The only record of *Rinodina subminuta* from the forest comes form locality.

W - USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, Washington. - Lat. 39° 41' 02"N, Long. 74° 34' 34"W. – Oak (*Quercus*) dominated pine (*Pinus*) / oak (*Quercus*) forest.

Though little remains of the abandoned town of Washington, the forest in this area is of particular interest because it is drier (more upland) and consists nearly entirely of oaks, unlike the surrounding area, which is almost exclusively pitch pine. The crustose lichen flora at this locality differs from other oak forests in the forest in being dominated by species that are less common elsewhere, especially *Lecanora hybocarpa, L. subpallens, Pyrenula pseudobufonia,* and *Rinodina maculans.*

APPENDIX II

PRIMARY SUBSTRATES FOR TAXA

	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Abrothallus cladoniae	x								
Acrocordia megalospora								x	
Acarospora glaucocarpa			x						
Agonimia sp.		x							
Agonimia opuntiella		x							
Amandinea polyspora								x	

Appendix II continued	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Anisomeridium polypori								x	
Anzia colpodes								x	
Arthonia sp.								x	
Bacidia coprodes			x						
Bacidia schweinitzii								x	
Bacidina sp.								x	
Bacidina egenula			x						
Biatora longispora								x	
Buellia curtisii								x	
Buellia stillingiana								x	
Caloplaca citrina			x						
Caloplaca feracissima			x						
Caloplaca flavovirescens			x						
Caloplaca subsoluta			x						
Candelaria concolor								x	
Candelariella efflorescens								x	
Candelariella reflexa								x	
Catinaria atropurpurea								x	
Chaenotheca hygrophila					x				
Chaenothecopsis savonica						x			
Chrysothrix flavovirens					x				
Cladonia arbuscula				x					
Cladonia atlantica				x					
Cladonia beaumontii		x							
Cladonia brevis				x					
Cladonia caespiticia		x							
Cladonia coniocraea		x							
Cladonia conista								x	
Cladonia cristatella				x					
Cladonia cryptochlorophaea		x							
Cladonia cylindrica		x							
Cladonia didyma		x				x			
Cladonia dimorphoclada				x					
Cladonia diversa		x							
Cladonia florekeana						x			
Cladonia floridana				x					
Cladonia grayi		x							
Cladonia incrassata		x				x			
Cladonia macilenta		x				x			
Cladonia ochrochlora		x				x		x	
Cladonia parasitica		x				x			
Cladonia peziziformis		x							
Cladonia ramulosa		x							

Appendix II continued	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Cladonia rappii		x							
Cladonia ravenelii		x							
Cladonia rei		x						x	
Cladonia santensis		x							
Cladonia sobolescens		x							
Cladonia strepsilis		x							
Cladonia submitis		x							
Cladonia subtenuis		x							
Cladonia uncialis		x							
Clypeococcum hypocenomycis	x								
Coeogonium pineti					x				
Collema subflaccidum								x	
Diploschistes muscorum	x								
Endocarpon spp.			x						
Flavoparmelia caperata								x	
Fuscidea arboricola							x		
Gyalideopsis sp.		x							
Hertelidea pseudobotryosa		x							
Heterodermia granulifera								x	
Heterodermia hypoleuca								x	
Heterodermia obscurata								x	
Heterodermia speciosa								x	
Hypocenomyce anthracophila					x				
Hypocenomyce friesii		x			x				
Hypocenomyce scalaris						x			
Hypogymnia physodes								x	x
Hypotrachyna livida								x	
Hypotrachyna osseoalba								x	
Hypotrachyna showmanii								x	
Imshaugia aleurites						x			
Imshaugia placorodia						x			
Julella fallaciosa								x	
Lecanora sp. 1	x								
Lecanora sp. 2						x			
Lecanora sp. 3		x						x	x
Lecanora cupressii								x	
Lecanora dispersa			x						
Lecanora hybocarpa								x	
Lecanora minutella						x			
Lecanora strobilina								x	

Appendix II continued	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Lecanora thysanophora								x	
Lecidea nylanderi						x			
Lecidea plebeja		x							
Lepraria caesiella						x		x	
Lepraria elobata								x	
Lepraria incana								x	
Lepraria lobificans		x	x					x	
Leptogium cyanescens								x	
Lobaria quercizans								x	
Loxospora pustulata								x	x
Melanixia subaurifera								x	
Micarea erratica			x						
Micarea globulosella								x	
Micarea melaena						x			
Micarea peliocarpa		x							
Micarea prasina		x			x				
Mycoblastus fucatus ?						x			x
Mycocalicium subtile		x						x	
Myelochroa aurulenta								x	
Nadvornikia sorediata								x	
Ochrolechia arborea								x	
Ochrolechia pseudopallescens						x			
Opegrapha vulgata								x	
Parmelia squarrosa								x	
Parmelia sulcata								x	
Parmelinopsis horrescens								x	
Parmelinopsis minarum								x	
Parmeliopsis subambigua						x			
Parmotrema hypoleucinum					x				
Parmotrema hypotropum					x			x	x
Parmotrema perforatum								x	
Parmotrema reticulatum						x		x	
Parmotrema subisidiosum								x	
Peltigera didactyla				x					
Pertusaria amara								x	
Pertusaria macounii								x	
Pertusaria ophthalmiza								x	
Pertusaria paratuberculifera								x	
Pertusaria pustulata								x	x
Pertusaria trachythallina								x	

Appendix II continued	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Phaeocalicium polyporaeum		x							
Phaeographis inusta								x	x
Phaeophyscia adiastola		x							
Phaeophyscia hirsuta		x							
Phaeophyscia rubropulchra								x	
Physcia adscendens			x		x				
Physcia americana			x					x	
Physcia millegrana			x					x	
Physcia pumilior								x	x
Physciella chloantha			x						
Physconia leucoleiptes			x		x			x	
Placidium arboreum								x	
Placynthiella dasaea		x				x			
Placynthiella icmalea		x							
Placynthiella oligotropha		x		x					
Placynthiella uliginosa				x					
Placynthium nigrum			x						
Pseudosagedia raphidospermum								x	
Psoroglaena dictyospora		x							
Punctelia rudecta						x		x	x
Punctelia subrudecta						x		x	x
Pycnothelia papillaria				x					
Pyrenula psuedobufonia								x	
Pyrrhospora varians						x		x	x
Pyxine sorediata								x	
Pyxine subcinerea								x	
Rhizocarpon reductum			x						
Rinodina maculans								x	x
Rinodina subminuta								x	
Ropalospora chlorantha								x	
Sarcogyne regularis			x						
Sarea resinae						x			
Schismatomma glaucescens								x	
Schismatomma pericleum								x	
Scoliciosporum chlorococcum								x	x
Segestria leptalea					x				
Stereocaulon glaucescens			x						
Trapelia sp.			x						
Trapelia glebulosa			x						
Trapelia placodioides			x						

Appendix II continued	Lichenicolous	Ligni-/muscicolous	Saxicolous	Terricolous	*Chamaecyparis*	*Pinus*	*Betula*	*Acer & Quercus*	Small shrubs
Trapeliopsis flexuosa		x				x			
Tuckermanella fendleri						x			
Tuckermanopsis americana						x		x	
Tuckermanopsis ciliaris						x		x	
Usnea mutabilis								x	
Usnea pensylvanica								x	
Usnea strigosa								x	
Usnea trichodea					x				
Verrucaria sp.			x						
Verrucaria muralis			x						
Vezdaea leprosa		x							
Vulpicida viridis					x				
Xanthoparmelia conspersa			x						
Lichenicole sp. 1	x								

Opuscula Philolichenum, **3**: 41-48. 2006.

Contributions to the Lichen Flora of Pennsylvania: A Preliminary Checklist of the Lichens of Nescopeck State Park

JAMES C. LENDEMER[1] & JAMES A. MACKLIN[2]

ABSTRACT. – A checklist of 68 species of lichens and lichenicolous fungi collected in Nescopeck State Park, Pennsylvania, USA, is provided. *Lepraria eburnea* J.R. Laundon, *Lepraria elobata* Tønsberg, *Rhizocarpon cinereovirens* (Müll. Arg.) Vainio, and *Rinodina vezdae* H. Mayrhofer are reported for the first time from Pennsylvania.

INTRODUCTION

In 2003 the authors received a grant from the Pennsylvania Department of Conservation and Natural Resources (DCNR) to study the lichen flora of Pennsylvania. The first phase of the grant involved the establishment of baseline floristic data for the eastern part of the state through field work in public park lands and several preserves privately managed by The Nature Conservancy (TNC) and The Natural Lands Trust (NLT) of eastern Pennsylvania. The results of some of this field work have already been reported in the form checklists of the Diabase Region of Upper Bucks and Montgomery Counties (Lendemer, 2005), the Delaware Water Gap National Recreation Area (Harris & Lendemer, 2005), and Lehigh Gorge State Park (Lendemer, 2004). This contribution continues these reports by providing a checklist of the lichens and lichenicolous fungi of Nescopeck State Park, Luzerne County, PA, based on two field visits in 2004-2005. As with similar surveys undertaken by the first author in Pennsylvania, the checklist presented here is intended to supplement the floristic inventory of the park already completed by A. Rhoads and T. Block (unpublished). Nescopeck State Park is located in the upper Nescopeck Valley of Luzerne County, Pennsylvania. It consists of 3,117 acres encompassing extensive hardwood forests, wetlands, and land formerly used for agriculture. The park is underlain by the Mauch Chunk Formation, which outcrops throughout the area (DCNR, 1980). Like Lehigh Gorge State Park, there are both glaciated and non-glaciated areas in the park (Crowl & Sevon 1980). Recent plans for development of the park make the establishment of baseline data of the lichen flora all the more urgent, as the level of human activity in the park is likely to increase with these changes.

CHECKLIST

The collection numbers following each abbreviated locality are those of the first author (JCL) and a full set of vouchers is deposited in the herbarium of the first author which is currently housed at The Academy of Natural Sciences of Philadelphia (PH) with a nearly complete set of duplicates in the herbarium of The New York Botanical Garden (NY). Additional material was widely distributed to other herbaria and several collections have been included in Lichens of Eastern North America Exsiccati distributed by the first author from PH.

[1] James C. Lendemer: Research Associate, Lichen Herbarium, Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Parkway, Philadelphia, PA, 19103, USA. e-mail: lendemer@acnatsci.org

[2] James A. Macklin: Collections Manager, Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Parkway, Philadelphia, PA, 19103, USA. e-mail: macklin@acnatsci.org

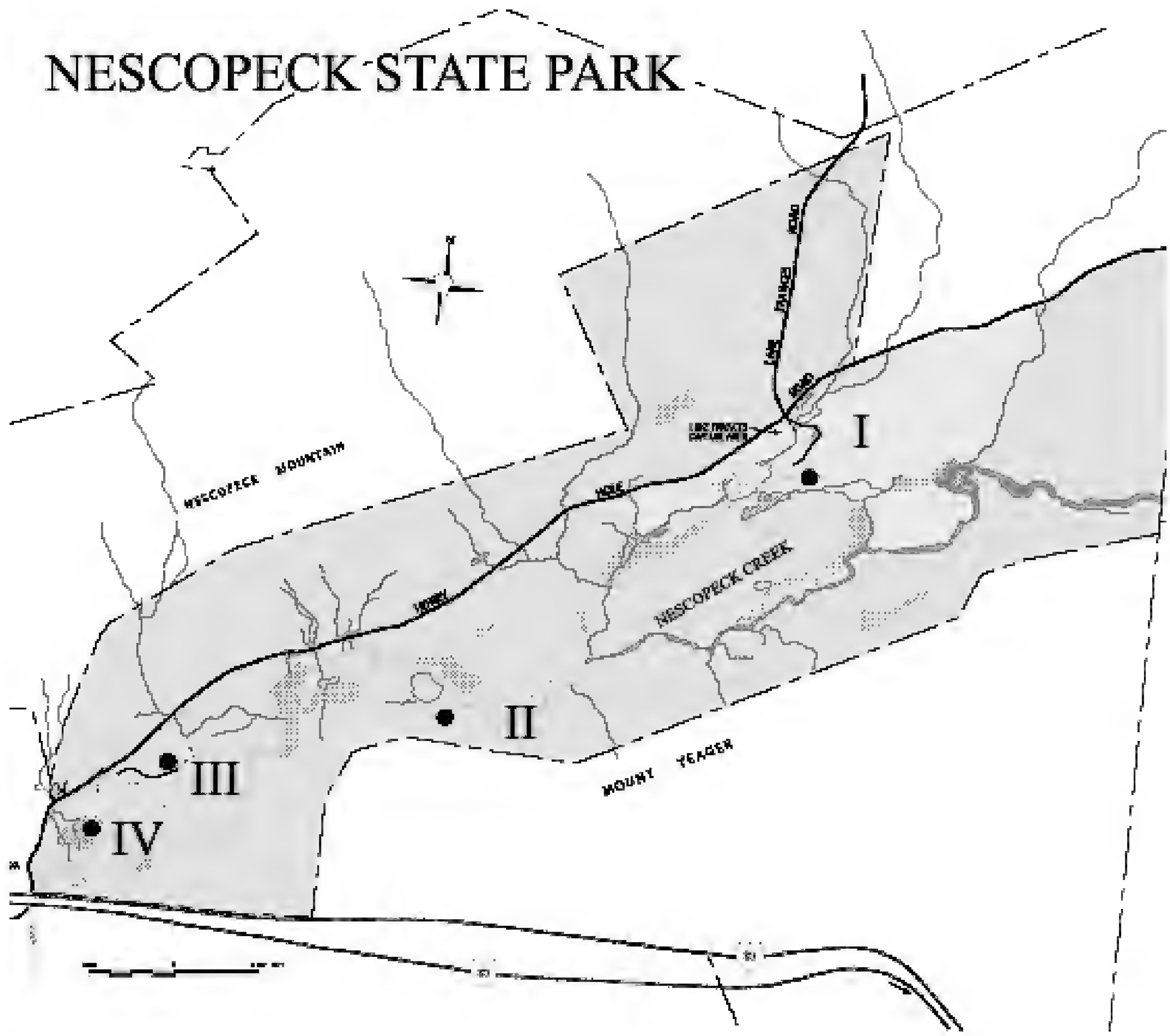

Plate 1. Map of Nescopeck State Park, Luzerne County, Pennsylvania, USA. (alteration of original map: http://www.dcnr.state.pa.us/stateparks/parks/maps/nescopeck_mini.pdf; 4.xii.2005)

Abrothallus caerulescens Kotte* – NSCIII, *2067* (on *Xanthoparmelia conspersa*).
Agonimia sp. – NSCI, *2064*.
Allocetraria oakesiana (Tuck.) Randlane & A. Thell – NSCI, *2024*.
Anisomeridium polypori (Ellis & Everh.) M.E. Barr – NSCIII, *3941*.
Aspicilia sp. – NSCII, *3952* (stictic acid).

The status of *Aspicilia* in eastern North America is problematic, as there seem to be several broad taxa widely used and poorly defined (e.g. including various thallus types, chemistry, spore sizes, and conidia types). The above collection could possibly be referred to *A. laevata* (Ach.) Arn.

Aspicilia sp. – NSCI, *2367*.

This collection has a dull blue-gray thallus with diffuse margins.

Bacidina delicata (Leight.) Poelt & Vězda ? – NSCII, *3932* (apothecia + pycnidia).

The material agrees with that reported by Harris & Lendemer (2005) in having a thallus composed of goniocysts and apothecia/pycnidia without any pigmentation.

Biatora longispora (Degel.) Lendemer & Printzen – NSCII, *2077*.
Biatora printzenii Tønsberg – NSCII, *2015, 2040, 2042* (all collections sterile).

Caloplaca oxfordensis Fink *ex* J. Hedrick – NSCIII, *2298*.
Candelaria concolor (Dick.) Stein – NSCI, *1996*.
Chrismofulvea dialyta (Nyl.) Marbach – NSCI, *2076*.
Cladonia conista A. Evans – NSCIII, *2036*.
Cladonia furcata (Huds.) Schrad. – NSCI, *2022*; NSCII, *2023*.
Cladonia ochrochlora Flörke – NSCI, *2025, 2028, 2029;* NSCII, *2027, 4022, 4023*; NSCIII, *4024*.
Cladonia parasitica (Hoffm.) Hoffm. – NSCI, *2002*.
Cladonia petrophila R.C. Harris – NSCI, *2000*; NSCIII, *4079*.
Cladonia polycarpoides Nyl. – NSCIII, *2061*.
Cladonia rei Schaer. – NSCIII, *2049, 4029*
Cladonia verticillata (Hoffm.) Schaer. – NSCIII, *2050*.
Flavoparmelia baltimorensis (Gyelnik & Fòriss) Hale – NSCI, *2045;* NSCII, *2008*; NSCIII, *3935*.
Lecanora polytropa (Hoffm.) Rabenh. – NSCIII, *3940*.

This species is apparently confined to the limited glade-like rock exposures in a series of abandoned fields and is heavily infected with an undetermined fungus. McGrath (1991) reported this species for the state from a single collection made by G.R. Proctor. We have not examined that voucher because McGrath's report does not indicate the herbaria in which the vouchers he examined were located.

Lecanora pulicaris (Pers.) Ach. – NSCIII, *2319*.

Harris & Lendemer (2005) were the first to report this species from the state. It appears uncommon but widespread.

Lecanora strobilina (Spreng.) Keiff. – NSCIII, *2073, 2240*.
Lecanora symmicta (Ach.) Ach. – NSCIII, *2074, 2290*.
Lecanora thysanophora R.C. Harris – NSCII, *2038;* NSCIII, *2016*.
Lecidea cyrtidia Tuck. – NSCII, *3926*.
"Lecidea" ahlesii Körb. *– NSCII, 3927, 3933*.
Lepraria sp. – NSCII, *3998*.

Though containing fumar/protocetraric acid and atranorin, this collection does not seem referable to *L. normandinoides ined.* or *L. nivalis,* as the thallus is composed of large soredia that aggregate together in a manner similar to *L. caesiella*. The collection lacks both a medulla and lobes.

Lepraria caesiella R.C. Harris – NSCI, *4195;* NSCII, *3996, 4229*; NSCIII, *3995*; NSCIV, *4230*.

Lendemer 3995 is a rather uncommon saxicolous collection of *L. caesiella*.

Lepraria caesioalba (de Lesd.) J.R. Laundon – NSCIII, *4004*.
Lepraria eburnea J.R. Laundon - NSCI, *2058* (muscicolous/saxicolous).

The above collection is not corticolous, and is referred to *Lepraria eburnea* with some hesitation, as the medulla is not very well developed. *Lepraria eburnea* has not previously been reported from Pennsylvania.

Lepraria elobata Tønsberg – NSCII, *3949*.
Lepraria lobificans Nyl. – NSCI, *2055, 2056*; NSCII, *2057, 3942, 3945, 3946, 3957, 4002*.
Lepraria neglecta (Nyl.) Erichsen – NSCIII, *3951*.
Lepraria normandinoides ined. – NSCII, *3999*.

This species is superficially similar to *Lepraria nivalis*. It seems to be distinguished by larger soredia, a thicker medulla, and much more robust thallus. It will be described in a future publication.

Leptogium dactylinum Tuck. – NSCI, *2408*.

The material is poorly developed and the species is apparently not common in the park.

Loxospora pustulata (Brodo & Culb.) R.C. Harris – NSCIII, *2004*.
Micarea peliocarpa (Anzi) Coppins & R. Sant. – NSCII, *3930, 3938;* NSCIII, *2299*.
Mycocalicium subtile (Pers.) Szatala – NSCI, *2409*.
Myelochroa aurulenta (Tuck.) Elix & Hale – NSCIV, *3937*.
Ochrolechia yasudae (Vain.) Oshio – NSCI, *1999*.
Parmelia sulcata Taylor – NSCII, *2003*.
Peltigera didactyla (With.) J.R. Laundon – NSCIII, *2096, 4034*.
Peltigera evansiana Gyelnik – NSCI, *2010, 2013*.
Peltigera horizontalis (Huds.) Baumg. – NSCII, *2078*.

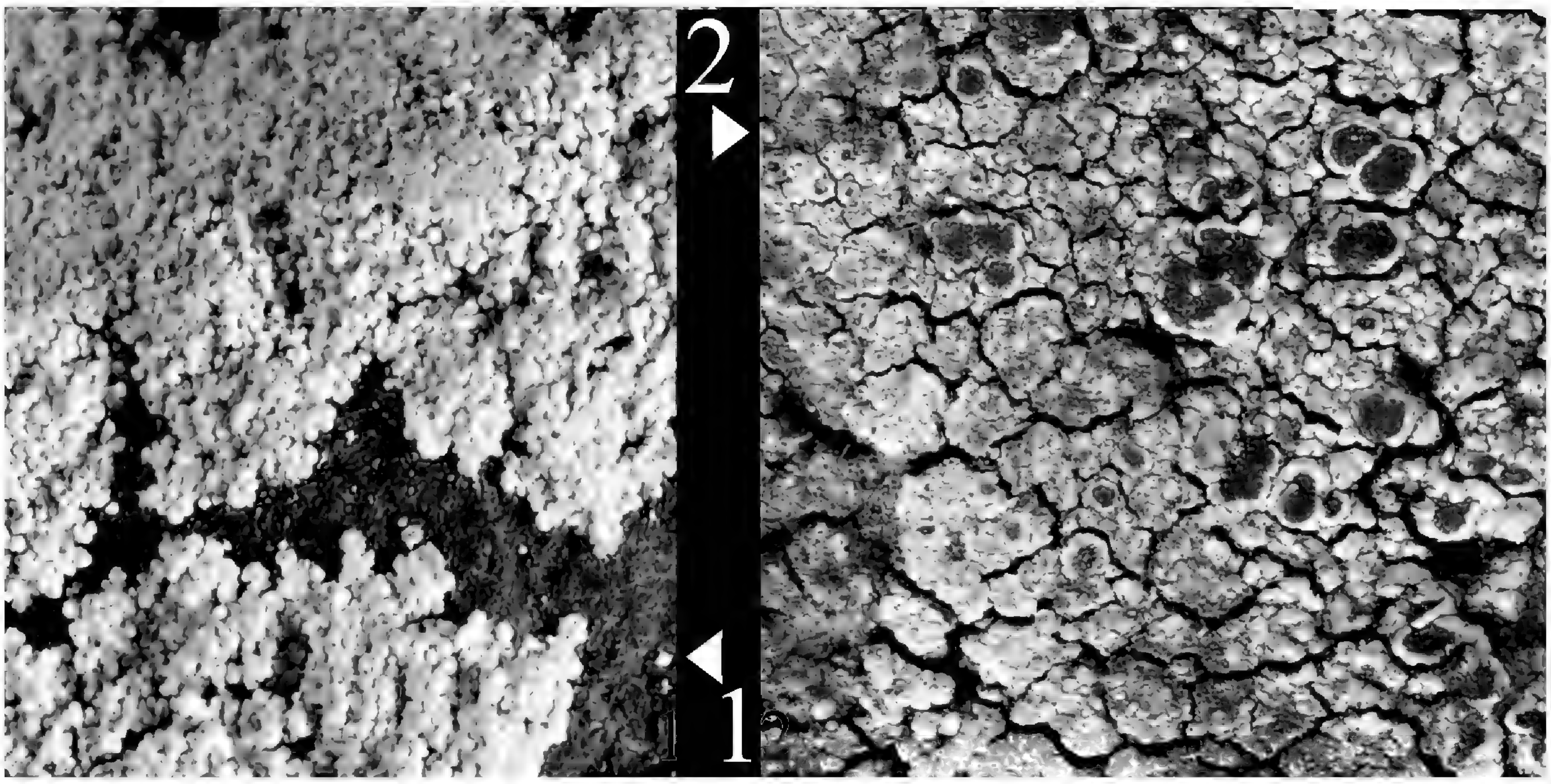

Plate 2. Fig. 1. Lepraria sp., Lendemer 3998, detail of thallus and thallus margins. *Fig.2. Rinodina vezdae, Lendemer 3955,* detail of thallus showing margins and apothecia.

Pertusaria plittiana Erichsen – NSCI, *2065.*
Phaeocalicium polyporaeum (Nyl.) Tibell – NSCI, *4194.*
Phaeophyscia adiastola (Essl.) Essl. – NSCI, *1994, 1997, 1998*; NSCII, *2009;* NSCIII, *2019.*
Phaeophyscia rubropulchra (Degel.) Essl. – NSCII, *2041, 3928.*

Lendemer 3928 is saxicolous and has coarse soredia that become lobulate in some parts of the thallus.

Phlyctis petraea ined. – NSCI, *2007, 2051*; NSCIII, *4026.*

This is the common saxicolous species also reported from New York by Harris (2004). The taxon is common throughout eastern North America and contains abundant norstictic acid.

Porpidia albocaerulescens (Wulfen) Hertel & Knoph – NSCIII, *2075.*
Porpidia crustulata (Ach.) Hertel & Knoph – NSCII, *2239, 3931.*
Punctelia rudecta (Ach.) Krog – NSCI, *2001, 1995,* NSCII, *2014, 2039, 3929.*
Punctelia subrudecta auct. Amer. – NSCIII, *4197* (fertile); NSCIV: *3939.*
Rhizocarpon cinereovirens (Müll. Arg.) Vain. – NSCI, *2068.*

This is the first report of the species from Pennsylvania.

Rhizocarpon infernulum f. *sylvaticum* Fryday – NSCII, *4211.*
Rinodina vezdae H. Mayrhofer – NSCIII, *3955.*

All previous reports of this species from Pennsylvania refer to *Rinodina oxydata* (A. Massal.) A. Massal. *s. lat.*, from which *R. vezdae* differs primarily in spore size and thallus type. The collection reported here is the first confirmed report of *R. vezdae* from the state. It should be noted that *R. vezdae* does not appear in the North American checklist (Esslinger, 2005), and we are unaware if it has been reported previously.

Sarcogyne regularis Körb.– NSCIV, *3936.*
Trapelia sp. – NSCIII, *2368, 2401.*

The above two collections are poorly developed and may represent an extreme of *T. glebulosa* (Sm.) J.R. Laundon.

Trapelia coarctata (Turner *ex* Sm.) M. Choisy ? – NSCII, *4077* (ascomata immature).
Trapelia placodioides Coppins & P. James – NSCI, *2083, 2407;* NSCIII, *2084.*
Umbilicaria mammulata (Ach.) Tuck. – NSCI, *2011, 2012.*
Verrucaria sp. – NSCII: *3934.*
Xanthoparmelia conspersa (Ehrh. *ex* Ach.) Hale – NSCIII, *2046, 3948.*

Xanthoparmelia cumberlandia (Gyelnik) Hale – NSCIII, *2005.*
Xanthoparmelia plittii (Gyelnik) Hale – NSCIII, *2006, 2047.*
Sterile sorediate crust sp. 1 (TLC: perlatolic acid group unknown) – NSCII, *3961, 3964, 3974;* NSCIII: *3963.*

This taxon is widely distributed throughout the state (and eastern North America) and likely represents a species of *Fuscidea* or *Ropalospora.*

Sterile sorediate crust sp. 2 (TLC: atranorin, roccellic acid?) – NSCI: *2089*; NSCII: *2087*, *4027, 4028*

The above collections represent a saxicolous species with a thick greenish blastidiate/granular thallus containing atranorin and roccellic acid?, it could represent a species of *Lecanora.* However, no fertile collections have been found.

Sterile sorediate crust sp. 3 (TLC: usnic acid, zeorin tr. (?)) – NSCIII: *4950.*

DISCUSSION

A total 68 species of lichens and lichenicolous fungi are reported from Nescopeck State Park. The species can mostly be divided into two groups reflecting the two primary habitat types that were surveyed: taxa occuring in rich shaded woods on the lower slopes of Mount Yeager, and those found in extensive open areas with sparse rock outcrops. The lower slopes of Mount Yeager are covered by northern hardwood forest; there is extensive dry oak – heath forest in the vicinity of Lake Francis. The lichens found in these two forest types did not differ significantly and any such differences in the checklist are likely the result of collection bias. The abandoned area in the Lower Day Use Area is of particular interest, because human disturbance has exposed small areas of flat bedrock, forming glade-like habitats where species of *Cladonia*, *Peltigera,* and *Xanthoparmelia* can dominate. A number of crustose lichens were found only in these open areas. Of particular interest are the reports of *Caloplaca oxfordensis* and *Lecanora polytropa*, as well as the first correct report of *Rinodina vezdae* from the state. Several species are thus reported for the first time from the Pennsylvania, namely: *Lepraria eburnea, Lepraria elobata, Rhizocarpon cinereovirens*, and *Rinodina vezdae*.

ACKNOWLEDGEMENTS

We thank the DCNR of Pennsylvania for providing funding for this study as well as permits to collect in this and other state parks in the region; also R.C. Harris for aid in the identification of problem specimens as well as for helpful discussion and criticism. K. Knudsen also provided much helpful criticism. We also thank R. Dirig and A.F. Rhoads for providing peer review of the manuscript.

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APPENDIX I

INDEX TO LOCALITIES

NSCI - USA. PENNSYLVANIA. LUZERNE CO.: Nescopeck State Park, south of intersection of Honey Hole Road and Lake Frances Road, "Reilly" on topographic map, just south of Lake Frances Day Use Area, along the north shore of an unnamed lake southeast of Lake Frances. – elev. ca. 1200 ft. - Lat. 41° 05' 22"N, Long. 75° 52' 28"W - Moist mixed northern hardwood forest (*Acer, Betula, Fraxinus,* etc.) with sparse hemlock, on a south-facing slope with abundant rock outcrops.

NSCII - USA. PENNSYLVANIA. LUZERNE CO.: Nescopeck State Park, south of Honey Hole Road, on the lower north facing slopes of Mount Yeager. – elev. ca. 1100 ft. - Lat. 41° 04' 22"N, Long. 75° 54' 23"W – Wet (many small streams and seeps), slope forested by *Acer, Betula, Fraxinus,* and *Tsuga* with abundant shaded sandstone ledges and exposed rock outcrops.

NSCIII - USA. PENNSYLVANIA. LUZERNE CO.: Nescopeck State Park, south of Honey Hole Road, on gentle southeast facing slopes above Nescopeck Creek, Lower Day-Use Area. – elev. ca. 1200 ft. – Lat. 41° 03' 59"N, Long. 75° 55' 20"W – Abandoned open pastureland with abundant disturbance based vegetation (*Rubus, Rosa,* etc.), with gentle sloping rock exposures and the remnants of stone walls bordering the fields.

NSCIV – USA. PENNSYLVANIA. LUZERNE CO.: Nescopeck State Park, south of Honey Hole Road, along tributary to Nescopeck Creek, below Lower Day-Use Area. – elev. ca. 1130 ft. - UTM 18 422854E 4546944N – Lat. 41° 04' 12"N, Long. 75° 55' 06"W – Swampy floodplain on sandy soil (*Acer, Quercus, Tsuga*, etc).

APPENDIX II

PRIMARY SUBSTRATES FOR TAXA

	corticolous	lichenicolous	lignicolous	muscicolous	saxicolous	terricolous	other
Abrothallus caerulescens		x					
Agonimia sp.				x			
Allocetraria oakesiana	x						
Anisomeridium polypori	x						
Aspicilia sp. 1					x		
Aspicilia sp. 2					x		
Bacidina delicata					x		

Appendix II continued	corticolous	lichenicolous	lignicolous	muscicolous	saxicolous	terricolous	other
Biatora longispora	x						
Biatora printzenii	x						
Caloplaca oxfordensis					x		
Candelaria concolor	x						
Chrismofulvea dialyta	x						
Cladonia conista						x	
Cladonia furcata			x				
Cladonia ochrochlora			x				
Cladonia parasitica			x				
Cladonia petrophila					x		
Cladonia polycarpoides						x	
Cladonia rei						x	
Cladonia verticillata			x				
Flavoparmelia baltimorensis					x		
Lecanora polytropa					x		
Lecanora pulicaris	x						
Lecanora strobilina	x						
Lecanora symmicta	x						
Lecanora thysanophora	x						
Lecidea cyrtidia					x		
Lepraria sp.					x		
Lepraria caesiella	x						
Lepraria caesioalba					x		
Lepraria eburnea				x			
Lepraria lobificans	x						
Lepraria neglecta					x		
Lepraria normandinoides					x		
Leptogium dactylinum				x			
Loxospora pustulata	x						
Micarea peliocarpa					x		
Mycobilimbia ahlesii					x		
Mycocalicium subtile			x				

Appendix II continued	corticolous	lichenicolous	lignicolous	muscicolous	saxicolous	terricolous	other
Myelochroa aurulenta	x						
Ochrolechia yasudae					x		
Parmelia sulcata	x						
Peltigera didactyla						x	
Peltigera evansiana			x				
Peltigera horizontalis			x				
Pertusaria plittiana					x		
Phaeocalicium polyporaeum							x
Phaeophyscia adiastola					x		
Phaeophyscia rubropulchra	x						
Phlyctis petraea ined.					x		
Porpidia albocaerulescens					x		
Porpidia crustulata					x		
Punctelia rudecta	x						
Punctelia subrudecta	x						
Rhizocarpon cinereovirens					x		
Rhizocarpon infernulum f. sylvaticum					x		
Rinodina vezdae					x		
Sarcogyne regularis					x		
Trapelia sp.					x		
Trapelia coarctata					x		
Trapelia placodioides					x		
Umbilicaria mammulata					x		
Verrucaria sp..					x		
Xanthoparmelia conspersa					x		
Xanthoparmelia plittii					x		
Sterile sorediate crust sp. 1	x						
Sterile sorediate crust sp. 2					x		
Sterile sorediate crust sp. 3	x						

Opuscula Philolichenum, **3**: 49-52. 2006.

Rare Lichen Habitats and Rare Lichen Species of Ventura County, California

KERRY KNUDSEN[1] & DAVID MAGNEY[2]

ABSTRACT. – Four sensitive lichen habitats - Maritime, Thin-Soil, Relative High-Humidity, Old-Growth Chaparral - of Ventura County, California and their associated rare species are discussed.

The lichen flora of the Santa Monica Mountains is especially important because it was extensively collected by Dr. Herman Hasse from 1890 to1915. His pioneer work supplies important baseline data. A modern revision needs to clarify the data, especially in light of the advances in lichen taxonomy. Kerry Knudsen is working on a lichen flora of the Santa Monica Mountains funded by the National Park Service (Knudsen 2005, Knudsen *in prep*) and has been collecting extensively in Ventura County. David Magney has been working with the Ventura County Planning Division to identify rare species and habitats within Ventura County as part of implementing General Plan policies and goals for conserving the biological resources of the county.

Several lichen species occurring in the Santa Monica Mountains in Ventura County are currently considered rare based on herbarium records and field observations. These include *Aspicilia glaucopsina* (Nyl. *ex* Hasse) Hue, *Cyphelium brunneum* W.A. Weber, *Placynthiella knudsenii* Lendemer, *Punctelia punctilla* (Hale) Krog, and *Texosporium sancti-jacobi* (Tuck.) Nádv. *ex* Tibell & Hofsten. Other rare species from the Santa Monica Mountains are expected in Ventura County such as *Endocarpon pseudosubnitescens* Breuss. It is also hoped that a number of lichen species collected in the Santa Monica Mountains by Herman Hasse, who died in 1915, may be rediscovered in Ventura County, including *Gylalideopsis athalloides* (Nyl.) Vezda, *Placopyrenium heppioides* (Zahlbr.) Breuss, and *Ramonia ablephora* (Nyl *ex* Hasse) R.C. Harris (Knudsen *in prep*).

A more extensive study of the lichen flora of Ventura County is needed beyond the Santa Monica Mountains. Nonetheless, the study of the Santa Monica Mountains already has begun the process of authenticating a list of rare lichens for Ventura County as well as for the Santa Monica Mountains National Recreation Area.

In Part Two of Kerry Knudsen's study of the Santa Monica Mountains he makes a preliminary classification of four lichen habitats that support high diversity and rare species (Knudsen *in prep*). These are Maritime Habitat, Thin-Soil Habitat, Relative High Humidity Habitat, and Old-Growth Chaparral Habitat. All of these habitats occur in Ventura County.

Because of the slow growth and the environmental sensitivity of most lichen species, a habitat approach to their conservation would likely be the most effective approach to use. This approach allows for the development of data sets on rare species without revisions causing confusion or mismanagement. It also conserves the biodiversity of the flora, which is often ignored by the rare species only approach. While a habitat approach is not used in current federal and California Endangered Species Acts, it can easily be implemented on the local level through planning and regulation of open space and biological resource overlay zones.

Each of the four lichen-rich habitats is described below.

[1]Kerry Knudsen: Lichen Curator, The Herbarium, Dept. of Botany & Plant Sciences, University of California, Riverside, California 92521-0124, USA. – email: kk999@msn.com

[2] David Magney: President, David Magney Environmental Consulting, P.O. Box 1346 Ojai, California 93024-1346, USA. – website: www.magney.org

MARITIME HABITAT

Maritime habitat exists above tide level along the coast of California and on the Channel Islands. High lichen diversity characterizes this community. It has suffered major degradation and fragmentation through coastal development. It contains the remaining California populations of many lichens such as *Niebla ceruchoides* (Bowler & Marsh 2005) as well as rare species like the endemic *Cyphelium brunneum,* with only two known reports from southern California (Tibell & Ryan 2005) until a site was discovered recently in Ventura County (Knudsen *in prep*).

The maritime habitat is relatively rare in mainland Ventura County because the coastal side of the Santa Monica Mountains and the rest of the county have a generally southern exposure. Despite the strong influence of fog, the arid aspect of the coastline combined with the Mediterranean climate and regular strong winds off the Pacific Ocean limits the diversity of lichens.

But relics of the habitat are found in Ventura County as far inland as Conejo Mountain on north slopes along the edge of the Oxnard Plain. These local sites harbor high lichen diversity and species richness, and contain both rare lichen species such as *Cyphelium brunneum* as well as abundant *Niebla* populations. These sites are also rich in vascular plants with large populations of *Coreopsis gigantea,* as well as two rare endemics, Conejo Buckwheat (*Eriogonium crocatum*) and *Dudleya verityi,* among others.

This habitat should be protected from further disturbance to protect this biological resource and the remaining habitat, especially on the north slope of Conejo Mountain, should be placed in an ecological reserve.

THIN-SOIL HABITAT

Thin-soil habitat occurs throughout southern California in opening of the chaparral and coastal sage scrub and on slopes and sandstone out crops, especially in terraces formed by Bigelow Spike-moss (*Selaginella bigelovii* Underwood). The soil is usually thin over bedrock and often clay sediment, poor in nutrients and organic debris. This habitat supports native annuals and perennial bulbs, and the main host plant for the rare and endangered Quino Checkerspot Butterfly, *Plantago erecta* E. Morris . In this habitat, lichens grow on soil in biological crusts with bryophytes. In Ventura County this habitat supports *Texosporium sancti-jacobi*, a rare lichen that is on the California Department of Fish and Game's Special Plants, Bryophytes and Lichens List (Riefner & Rosentreter 2004). *Aspicilia glaucopsina* is known from approximately seven sites at this time, including one thin-soiled habitat on Sandstone Peak (Knudsen 2005) and is expected on other Ventura County sites. *Placynthiella knudsenii* is known from only six sites worldwide at this time including the Sandstone Peak area and is expected on other similar sites in Ventura County (Lendemer 2004, Ryan *et al.* 2005, Knudsen 2005). Several very rare lichens occur in thin-soil habitat such as the *Gylalideopsis athalloides* and *Ramonia ablephora.* Neither has been collected in southern California since the turn of the 20th century and they might potentially be rediscovered in Ventura County.

Thin-soiled habitat was probably common in southern California before ranching and then urban and suburban development transformed the southern California landscape. Invasive non-native annual plants, probably favored through dry nitrate deposition from agricultural fertilizers and air pollution, have indirectly degraded this habitat in many areas including Sandstone Peak. Nonetheless, thin-soil habitat persists on ridges and arid inland locations. Damage to this habitat should be mitigated when it contains a rich lichen flora, or any rare lichen species.

RELATIVE HIGH-HUMIDITY HABITAT

Relative high-humidity habitat occurs in a patchwork through out southern California and is rich in lichen biodiversity. It occurs usually on north-facing or partially shaded areas where storm drainage or a nearby creek or pond supplies seasonal or constant higher humidity than normally occurs in similar sites with less shelter or water input. Relative high-humidity habitat differs from maritime habitat because, while it can be favored by fog from dense marine layers, it generally occurs in arid, more inland locations. The majority of lichens that occur in this habitat, although often colorful, are usually common. This habitat probably acts as spore and propagule bank that replenishes the general diversity of lichens across the landscape. In Ventura County, this habitat supports one of only two Californian populations of the rare tropical macrolichen *Punctelia punctilla* (Egan & Aptroot 2005, Knudsen *in prep*). Relative high-humidity habitat may also support in Ventura County *Endocarpon pseudosubnitescens* Breuss, currently known from

only three locations worldwide, two in Baja (Breuss, 2002) and one in Los Angeles County in the Santa Monica Mountains where it occurs with *Punctelia punctilla* (Knudsen 2005, Knudsen *in prep*).

Further degradation of this habitat should be considered a significant impact and mitigated, and areas especially rich in this habitat and containing either of the above rare species should be preserved.

OLD GROWTH CHAPARRAL HABITAT

This habitat occurs across southern California in a patchwork pattern. In the Santa Monica Mountains and coastal Ventura County lightning does not generally ignite the chaparral. The fire regime of this area before the 20th century had a relatively low fire frequency. Under those conditions the chaparral goes through a self-renewing cycle of growth and senescence (Halsey 2005). Old-growth chaparral supports epiphytic lichens in rich concentrations (Knudsen *in prep*). Old-growth chaparral supports many corticolous (bark-dwelling) lichen crusts including some endemic species that were once common in the Santa Monica Mountains in Los Angeles and Ventura Counties (Hasse 1913) but are now rare and possibly extirpated (Knudsen *in prep*). The probable cause of this rarity is the anthropogenic increase in fire frequency has reduced intervals between fires to 10 to 20-years in some areas. The increased fire frequency has definitely caused a decrease in the lichen diversity in the chaparral and whole areas may support little or no lichens where the frequent occurrence of fires does not support the renewal and slow growth of lichen communities on bark and have depleted their spore and propagule banks.

Though the air quality is relatively good in Ventura County, air pollution decreases lichen diversity in chaparral, eliminating pollution-sensitive species. Air pollution can acidify bark pH, which probably limits the growth of algal species necessary for lichenization as well as eliminates acid-sensitive lichens from the local flora.

The conservation of this habitat is problematic in a landscape where the fire regime has changed. However, areas of old-growth chaparral should be identified and given priority as open space in Ventura County planning.

CONCLUSION

The conservation of lichen habitats preserves the biodiversity of lichens in southern California and supports the rare lichen species enumerated as well as numerous species that could become rare in the future without far-sighted conservation planning at the local level. The recognition of lichen habitats as a valuable component of Ventura County biological resources enriches the natural beauty of existing open space with a colorful dimension often noticed, but whose aesthetic value has been neglected in the past.

ACKNOWLEDGEMENTS

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Contributions to the Lichen Flora of Pennsylvania: A Preliminary Checklist of the Lichens of Worlds End State Park

JAMES C. LENDEMER[1] & JAMES A. MACKLIN[2]

ABSTRACT. – A checklist reports 118 species of lichens, lichenicolous fungi, and non-lichenized fungi often treated with lichens, from Worlds End State Park, Sullivan Co., Pennsylvania, USA. The following species are reported for the first time from the state of Pennsylvania: *Arthothelium ruanum* (A. Massal.) Körb., *Baeomyces rufus* (Huds.) Rebent., *Caloplaca chrysodeta* (Vainio *ex* Räsänen) Dombr., *Cetrelia cetrarioides* (Delise ex Duby) Culb. & Culb., *Chaenotheca brunneola* (Ach.) Müll. Arg., *Chaenothecopsis pusilla* (Flörke) A.F.W. Schmidt, *Chaenothecopsis viridialba* (Kremp.) A.F.W. Schmidt, *Cresponea chloroconia* (Tuck.) Egea & Torrente, *Lepraria crassissima* (Hue) Lettau *s. lat., Polycoccum minutulum* Kocourk. & F. Berger, *Rhizocarpon lavatum* (Fr.) Hazsl., *Rinodina adirondackii* H. Magn., *Trichonectria rubefaciens* (Ellis & Everh.) Diederich & Schroers, and *Vezdaea retigera* Poelt & Döbbeler.

INTRODUCTION

The checklist presented here continues a series of reports resulting from the receipt of a grant to the authors from the Pennsylvania Department of Conservation and Natural Resources (DCNR) to study the lichen flora of eastern Pennsylvania. The primary goal of the grant was to survey public parklands as well as privately managed preserves in eastern Pennsylvania. The previous reports in this ongoing series (Lendemer 2004, Lendemer 2005, Harris & Lendemer 2005, Lendemer & Macklin 2006) have started to provide a sketch of the present-day lichen flora of Pennsylvania, one of the most under collected regions in eastern North America. This contribution follows the format of the previous reports and is based on two field visits in 2004-2005 to Worlds End State Park, Sullivan County, PA.

The park lies on 780 acres of the Loyalsock Creek gorge in the Allegheny High Plateau of northeastern Pennsylvania. The steep, often rocky slopes on either side of the creek are forested primarily by mixed hardwoods (*Acer, Betula, Fraxinus, Quercus, Tilia*) and hemlock (*Tsuga canadensis*). The habitats found in the park are similar in some respects to those of the Delaware Water Gap National Recreation Area and the species list presented here is likewise similar. During our visits to the park we attempted to sample as many habitat types as possible. However, because of the steep terrain we were unable to reach some locations. Similar habitats in the adjacent Wyoming State Forest were visited in an effort to include species that might occur in the areas we were unable to reach. These collections are included in the checklist.

The geology of the park is diverse in that it includes outcrops of several different formations. The Burgoon Sandstone consists of gray sandstones exposed at middle elevations throughout the park. The Huntley Mountain Formation is exposed at the base of the gorge and includes poorly resistant sandstone and shale. The red shales of the Mauch Chunk Formation are exposed throughout the park and occurs above the exposures of the Burgoon Sandstone. The highly resistant conglomerate and sandstone of the Pottsville Group are exposed on the highest parts of ridges in the park. The above geological diversity combined with the array of microhabitats created by the steep topography and large number of small streams and tributaries to Loyalsock Creek is likely responsible for the lichen diversity in the park.

[1] James C. Lendemer: Research Associate, Lichen Herbarium, Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Parkway, Philadelphia, PA, 19103, USA. e-mail: lendemer@acnatsci.org

[2] James A. Macklin: Collections Manager, Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Parkway, Philadelphia, PA, 19103, USA. e-mail: macklin@acnatsci.org

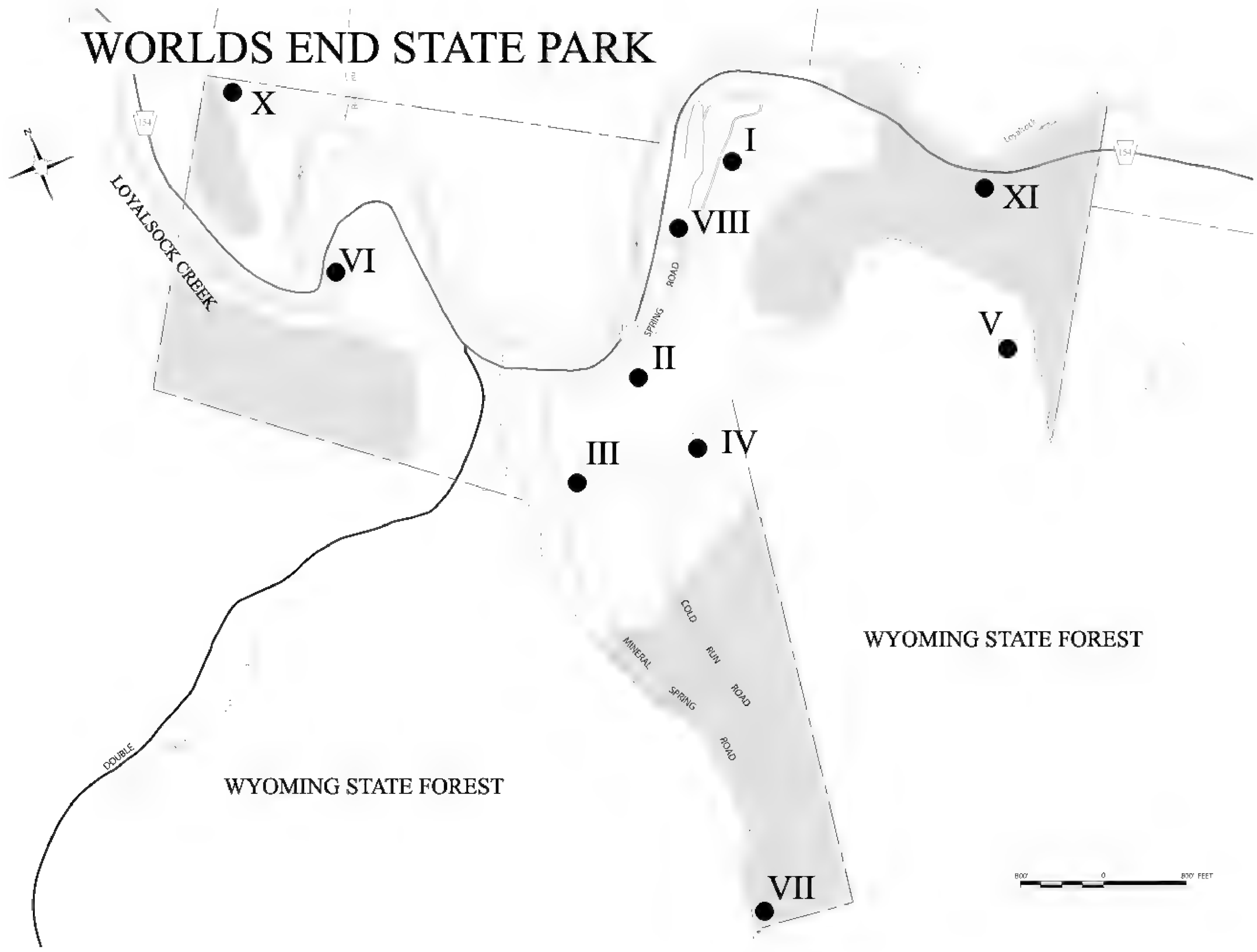

Fig. 1 – Map of Worlds End State Park, Sullivan County, Pennsylvania, USA. Roman numerals correspond to locality data in Appendix I. Note WESPIX is out of the range of the map. This image is an alteration of: http://www.dcnr.state.pa.us/-stateparks/parks/maps/worldsend_mini.pdf; 4.xii.2005.

CHECKLIST

The checklist presented below follows essentially the same format as that of Nescopeck State Park (Lendemer & Macklin 2006). The checklist is based on two field trips to Worlds End State Park by the authors in 2004-2005. The collection numbers are those of the first author and the full locality data is included as an appendix at the end of the paper. When taxonomy or nomenclature differs from standard checklists or treatments such as Esslinger (2005) these differences reflect the opinions/research of the authors. In many instances these differences are explained. Partially identified material is included throughout the list and sterile sorediate crusts that cannot be placed to genus are grouped by chemistry at the end of the list. Non-lichenized fungi often treated with lichens, such as calicioid fungi are included in the list as are lichenicolous fungi (denoted with "*" following the name).

Agonimia sp. – WESPIII, *2316*.
Allocetraria oakesiana (Tuck.) Randlane & A. Thell – WESPII, *2272;* WESPIV, *2281;* WESPV, *2252*.
Amandinea polyspora (Willey) E. Lay & P.F. May – WESPXI, *5206*.
Anaptychia palmulata (Michx.) Vainio – WESPVI, *5254*; WESPXI, *5274*.
Anisomeridium distans (Willey) R.C. Harris – WESPI, *2327*.
Anisomeridium polypori (Ellis & Everh.) M.E. Barr – WESPVI, *5210*.
Arthonia caesia (Flot.) Körber – WESPI, *2317*.
Arthothelium ruanum (A. Massal.) Körb. – WESPVI, *5256*; WESPXI, *5205*.

The above collections are the first report of *A. ruanum* from Pennsylvania.

Bacidia schweinitzii (Fr. *ex* Michener) A. Schneid. – WESPVI, *5216;* WESPVIII, *5226*.
Baeomyces rufus (Huds.) Rebent. – WESPVI, *5288*.
This species was found on large rocks periodically submerged in Loyalsock Creek. Surprisingly this is the first report for Pennsylvania.
Biatora longispora (Degel.) Lendemer & Printzen – WESPV, *2238*; WESPVI, *5213*.
Biatora printzenii Tønsberg – WESPIII, *2406* (sterile); WESPVI, *5290, 5292*.
Bilimbia sabuletorum (Schreb.) Arnold – WESPVI, *5245*.
Caloplaca chrysodeta (Vainio *ex* Räsänen) Dombr. – WESPII, *2197*.
This is the first report of *C. chrysodeta* from Pennsylvania. The collection was made on a shaded concrete [!] overhang on a steep north-facing slope.
Caloplaca feracissima H. Magn. – WESPVI, *5216*.
Cetrelia cetrarioides (Delise *ex* Duby) Culb. & Culb. – WESPVI, *5351*.
This is the first report of *C. cetrarioides* from Pennsylvania. The species was found on a branch fallen from the canopy of a birch (*Betula*).
Chaenotheca brunneola (Ach.) Müll. Arg. – WESPVI, *5257;* WESPIX, *5222, 5268*.
These are the first reports of *C. brunneola* from Pennsylvania, like most calicicoid fungi it is likely overlooked. The authors also collected the species in Monroe County, PA[3].
Chaenothecopsis pusilla (Flörke) A.F.W. Schmidt – WESPVI, *5258;* WESPIX, *5269;* WESPX, *5271*.
The above collections appear to be the first report of the species from Pennsylvania.
Chaenothecopsis viridialba (Kremp.) A.F.W. Schmidt – WESPIX, *5209*.
The above collection was found on the wood of a moist shaded rotting hemlock (*Tsuga*). It is the first report of the species from Pennsylvania.
Chrismofulvea dialyta (Nyl.) Marbach – WESPIV, *2341*.
Cladonia cristatella Tuck. – WESPVI, *5335*.
Cladonia furcata (Huds.) Schrad. – WESPI, *2293;* WESPII, *2296*; WESPX, 5354.
Cladonia grayi G. Merr. *ex* Sandst. – WESPIV, *2385*; WESPVI, *5355*.
Cladonia incrassata Flörke – WESPVI, *5353*.
Cladonia ochrochlora Flörke – WESPVI, *5352;* WESPIX, *5349*.
Cladonia parasitica (Hoffm.) Hoffm. – WESPIX, *5348*.
Cladonia ramulosa (With.) J.R. Laundon – WESPIX, *5359*.
Cladonia squamosa Hoffm. – WESPII, *3398*; WESPVI, *5350*.
Coenogonium pineti (Ach.) Lücking & Lumbsch – WESPVI, *5202*.
Cresponea chloroconia (Tuck.) Egea & Torrente – WESPX, *5229*.
This species was only found on a single hemlock (*Tsuga*), the only record of *Punctelia appalachensis* from the park was also found on this tree. This is the first report of *C. chloroconia* from Pennsylvania.
Dictyocatenulata alba Finley & E.F. Morris – WESPVI, *5212*; WESPVII, *5225*; WESPXI, *5262*.
Endocarpon pallidulum (Nyl.) Nyl. – WESPVI, *5215*.
Evernia mesomorpha Nyl. – WESPV, *2264*.
Flavoparmelia caperata (L.) Hale – WESPI, *2273;* WESPIII, *2278;* WESPIV, *2280;* WESPV, *2254*; WESPXI, *5263*.
Halecania rheophila R.C. Harris & Ladd *ined.* – WESPVI, *5221*.
This species was reported from the Delaware Water Gap by Harris & Lendemer (2005) as *Halecania* sp.
Hypocenomyce scalaris (Ach.) M. Choisy – WESPIV, *2342*.
Hypogymnia physodes (L.) Nyl. – WESPV, *2261*; WESPVI, *5248*; WESPXI, *5204*.
Hypotrachyna showmanii Hale – WESPV, *2386*; WESPXI, *5267*.
Imshaugia aleurites (Ach.) S.F. Meyer – WESPV, *2262*.
Ionaspis lacustris (With.) J.R. Laundon – WESPVI, *5218*.
Lasallia papulosa (Ach.) Llano – WESPIV, *2267*.
Lecanora cinereofusca H. Magn. – WESPII, *2394*; WESPXI, *5266*.

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[3] *Chaenotheca brunneola* (Ach.) Mull. Arg. – **USA. PENNSYLVANIA. MONROE CO.:** State Game Lands No. 127, south of PA Route #423, ca. 1 mile southwest of intersection PA Routes #423 & #611. – elev. 1860 ft. - Lat. 41° 10' 07"N, Long. 75° 26' 10"W – Swampy upland mixed hardwood forest (*Acer rubrum, Quercus, Betula, Tsuga*). *Lendemer 3920 & Macklin* (NY!, hbL!).

Lecanora dispersa (Pers.) Sommerf. – WESPVI, *5217*.
Lecanora polytropa (Hoffm.) Rabenh. – WESPVI, *5276*.
Lecanora pulicaris (Pers.) Ach. – WESPVI, *5246*.
Lecanora strobilina (Spreng.) Keif. – WESPI, *2283*; WESPXI, *5201*.
Lecanora thysanophora R.C. Harris – WESPIII, *2361*.
Lecidea ahlesii (Körber) Nyl. var. *ahlesii* – WESPVII, *5227*.
Lepraria caesiella R.C. Harris – WESPVIII, *5268*; WESPX, *5280* (saxicolous).
Lepraria crassissima (Hue) Lettau *s. lat.* – WESPII, *2207, 3431*; WESPVIII, *5281*.

Lepraria cassissima is a rather distinctive species, having a well-developed blue-gray thallus that is UV+ blue/white (divaricatic acid). The name is applied with some hesitation to our collections.

Lepraria lobificans Nyl. – WESPII, *3430*.
Lepraria neglecta (Nyl.) Erichsen – WESPX, *5234*.
Lepraria normandinoides ined. – WESPVI, *5289;* WESPX, *5277, 5279*.
Leptogium dactylinum Tuck. – WESPIII, *2311*.
Lithothelium hyalosporum (Nyl.) Aptroot – WESPVIII, *5239*.
Loxospora sp. – WESPIV, *2375*.

The above collection could represent a saxicolous form of *Loxospora pustulata* (Brodo & Culberson) R.C. Harris. There is however, a distinct possibility that more than one species of *Loxospora/Pertusaria* has evolved to reproduce primarily by pustules/schizidia. The problem is currently under study.

Loxospora pustulata (Brodo & Culb.) R.C. Harris – WESPII, *2333*; WESPX, *5242*.
Melanelixia fuliginosa (Fr. *ex* Duby) O. Blanco et al. – WESPXI, *5203*.
Melanelixia subaurifera (Nyl.) Blanco et al. – WESPI, *2269*.
Micarea erratica (Körber) Hertel et al. – WESPVI, *5276-A* (filed with *Lecanora polytropa*).
Micarea melaena (Nyl.) Hedl. – WESPV, *2329*; WESPIV, *5255*.
Micarea peliocarpa (Anzi) Coppins & R. Sant. – WESPV, *2776*.
Micarea prasina Fr. – WESPII, *2370*.
Mycocalicium subtile (Pers.) Szatala – WESPVI, *5260;* WESPIX*, 5220, 5223*.
Myelochroa aurulenta (Tuck.) Elix & Hale – WESPVI, *5251*.
Nadvornikia sorediata R.C. Harris – WESPI, *2243*; WESPVI, *5291*.
Ochrolechia arborea (Kreyer) Almb. – WESPI, *2271*; WESPVI, *5250*.
Opegrapha sp.* - WESPX, *5240-A* (on *Verrucaria* sp., on sandstone).
Parmelia squarrosa Hale – WESPV, *2265;* WESPXI, *5264*.
Parmelia sulcata Taylor – WESPI, *2251*; WESPIV, *2279*.
Peltigera evansiana Gyeln. – WESPIII, *2256*.
Pertusaria sp. – WESPVI, *5298*.
Pertusaria macounii (I.M. Lamb) Dibben – WESPXI, *5217*.
Pertusaria multipunctoides Dibben – WESPII, *2337* (saxicolous).
Phaeocalicium polyporaeum (Nyl.) Tibell – WESPVIX, *5270*.
Phaeophyscia adiastola (Essl.) Essl. – WESPIII, *2266*; WESPVI, *5214*.
Phaeophyscia pusilloides (Zahlbr.) Essl. – WESPVIII, *5224*.
Phaeophyscia rubropulchra (Degel.) Essl. – WESPV, *2268*.
Physcia stellaris (L.) Nyl. – WESPVI, *5247*.
Physcia subtilis Degel. – WESPX, *5237*.
Phlyctis petraea R.C. Harris ined. – WESPVI, *5272*; WESPX, *5236*.

This unpublished name should be applied to the widespread sterile saxicolous species that contains abundant norstictic acid.

Placynthiella sp. ? – WESPII, *2201*.

The above collection contains gyrophoric acid and may represent a species of *Placynthiella* or *Micarea*.

Placynthiella icmalea (Ach.) Coppins & P. James – WESPVI, *5296*.
Polycoccum minutulum Kocourk. & F. Berger* (on *Trapelia placodioides*) - WESPII, *2212*.

This is the first report of the species from Pennsylvania.

Porpidia albocaerulescens (Wulfen) Hertel & Knoph – WESPII, *2282*.
Psilolechia lucida (Ach.) M. Choisy – WESPX, *5235*.

Punctelia appalachensis (Culb.) Krog – WESPX, *5232*.

The presence of this species is not unexpected, and it is with some pleasure that we report *P. appalachensis* for the first time from Pennsylvania.

Punctelia rudecta (Ach.) Krog – WESPII, *2270;* WESPIII, *2275;* WESPV, *2260*; WESPIX, *5273*.

Punctelia subrudecta auct. Amer. – WESPI, *2244*; WESPIV, *2245*; WESPV, *2255*.

Pyrenula subelliptica (Tuck.) R.C. Harris – WESPIII, *2359*.

Pyxine sorediata (Ach.) Mont. – WESPIII, *2303*; WESPVI, *5253*.

Rhizocarpon lavatum (Fr.) Hazsl. – WESPVI, *5219*.

This species does not appear to have been previously reported from Pennsylvania. The species was found on rocks periodically submerged in water with *Ionaspis lacustris*.

Rhizocarpon infernulum f. *sylvaticum* Fryday – WESPII, *2294*.

Rinodina adirondackii H. Magn. – WESPVIII, *5244*.

This species does not appear to have been previously reported from Pennsylvania.

Rinodina subminuta H. Magn. – WESPVI, *5252*.

Segestria leptalea (Durieu & Mont.) R.C. Harris – WESPII, *3393*; WESPVI, *5249;* WESPVII, *5228, 5238*; WESPX, *5230*; WESPXI, *5200*.

The abundance of this species in the park was somewhat surprising. Our collections seem to indicate that further study of North American material is required to fully understand the *Segestria lectissima/leptalea* complex in eastern North America. Harris (1995), who based his concepts on Purvis (1992), separated the species on the basis of ascospore size and reported that *S. leptalea* can be both corticolous and saxicolous while *S. lectissima* is saxicolous. While our corticolous material of *S. leptalea* agrees well with published ascospore sizes the saxicolous material from dry exposed sites seems to consistently have larger ascospores, perhaps due to random abortion, all of whose measurements fall in the size overlap of the two species. Further, a collection on rock from a humid stream valley has a well developed epilithic thallus (perhaps due to the habitat) and ascospores whose size matches that of corticolous material of *S. leptalea*.

Stigmidium fuscatae (Arnold) R. Sant.* (on *Acarospora fuscata*) – WESPV, *2213*.

Strigula stigmatella (Ach.) R.C. Harris – WESPIII, *2340*.

Trapelia coarctata (Turner *ex* Sm.) M. Choisy – WESPI, *2403*; WESPVII, *5233*.

This species is easily recognized by the C+ pink, thin blue-gray, esorediate thallus with erumpent apothecia that possess a thin layer of white thalline tissue as they emerge, and ascospores 15-20 x 7.5-8µm (15-25 x 7-13µm *fide* Coppins & James (1984)). Though apparently not common in the region, it could be mistaken for *T. placodioides* Coppins & P. James, a sorediate species with a thicker placodioid thallus. Some material currently referred to *Trapelia involuta* (Taylor) Hertel is also superficially similar however that species does not have erumpent apothecia.

Trapelia placodioides Coppins & P. James – WESPI, *2241, 2315*; WSPX, *5231*.

Trapeliopsis flexuosa (Fr.) Coppins & P. James – WESPV, *2233, 2242*.

Trapeliopsis viridescens (Schrad.) Coppins & P. James – WESPIX, *5208*.

Trichonectria rubefaciens (Ellis & Everh.) Diederich & Schroers.* – WESPX, *5243* (on *Aspicilia*), *5241* (on *Porpidia*).

These are the first reports of *T. rubefaciens* for Pennsylvania.

Trypethelium virens Tuck. *ex* Michener – WESPVI, *5259*.

Umbilicaria mammulata (Ach.) Tuck. – WESPII, *2257*.

Verrucaria sp. – WESPX, *5240*.

Vezdaea retigera Poelt & Döbbeler – WESPI, *2284*.

This collection is the first report of *V. retigera* for North America (see Lendemer & Yahr, 2004). Stipitate apothecia and 1-septate ascospores, easily distinguish the only other species presently reported from Pennsylvania, *V. leprosa* (P. James) Vezda. *Vezdaea retigera* differs from other species currently reported from North America by its simple ascospores without punctuate walls, non-stipitate apothecia, and anastomosing paraphyses that adhere to the asci.

Xanthoparmelia conspersa (Ehrh. *ex* Ach.) Hale – WESPX, *5287*.

Xanthoparmelia cumberlandia (Gyeln.) Hale – WESPV, *2382*.

Xanthoparmelia plittii (Gyeln.) Hale – WESPIV, *2301, 2302*.

Lichenicole sp.* - WESPXI, 5211 (on thallus of *Biatora longispora*).

Harris (pers. comm.) noted some similarity between this collection and the macroconidial state of a *Strigula* species, it is not a *Strigula* however. Further study is needed to determine the correct placement of the collection.

Sterile sorediate crust sp. 1 (TLC: atranorin, zeorin, stictic acid, constictic acid; corticolous) – WESPVI, *5297*.

Sp. 1, represents one of many collections with this chemistry from Pennsylvania and New Jersey encountered by the first author. At first glance (in the field) the thallus appears leprose and reminiscent of *Lepraria elobata* Tønsberg, however further study reveals it to have poorly defined soralia that become diffuse with age.

Sterile sorediate crust sp. 2 (TLC: perlatolic acid group unknown; corticolous) – WESPIX, *5285*.

Sp. 2 has been reported from throughout eastern North America. It likely represents a species of *Fuscidea* or *Ropalospora*.

Sterile sorediate crust sp. 3 (TLC: atranorin, roccellic acid?; saxicolous) – WESPII, *2198*; WESPX, *5278*.

Sp. 3 has also been reported from Nescopeck State Park, Pennsylvania by Lendemer & Macklin (2006). A number of similar specimens lacking the fatty acid are also known from elsewhere in Pennsylvania.

Sterile sorediate crust sp. 4 (TLC: no substances detected; corticolous) – WESPXI, *5262*.

DISCUSSION

It seems likely additional survey work would significantly increase the list presented here. This conclusion is based on the number of species that are represented by single collections made from isolated (but often large) individuals or populations (and the fact that the list from the relatively close Delaware Water Gap National Recreation Area contains more than twice as many taxa). It should be noted that this phenomenon has also been observed in southern New Jersey (Lendemer, 2006) where many species were found only as large isolated populations at a single locality. One must question if this indicates that estimates of lichen diversity in a given area are often too low because the majority of species are never collected. As the first author's survey work in Wharton State Forest, NJ has clearly shown, intensive collecting in a single small geographic region often results in the discovery of numerous previous unrecognized taxa. Similar efforts by other lichenologists throughout North/Central America, such as those in the Ozark ecoregion and Sonoran Desert Region also serve to confirm the intuitive conclusion that intensive collecting provides a more complete picture of the lichen diversity in a given region. This checklist, and others like it, clearly provide only a glimpse of the lichens growing in a particular region and should thus be considered baseline for future, more detailed and intensive studies.

Our survey of Worlds End State Park resulted in a number of rather unexpected discoveries. These discoveries only serve to reaffirm the statement that the lichen flora of Pennsylvania is badly in need of further study. The presence of species with an Appalachian/Great Lakes distribution (Brodo et al. 2001) such as *Cetrelia cetrarioides,* and *Punctelia appalachensis* is logical since the park is located in the Appalachian Mountains. The occurrence of these species is somewhat unexpected however, because they have not been collected at other Appalachian localities in Pennsylvania during previous studies by the first author. The reports of *C. cetrarioides* and *P. appalachensis* are the first for Pennsylvania. The following taxa are also newly reported here: *Arthothelium ruanum* (A. Massal.) Körb., *Baeomyces rufus* (Huds.) Rebent., *Caloplaca chrysodeta* (Vainio *ex* Räsänen) Dombr., *Cetrelia cetrarioides* (Delise ex Duby) Culb. & Culb., *Chaenotheca brunneola* (Ach.) Müll. Arg., *Chaenothecopsis pusilla* (Flörke) A.F.W. Schmidt, *Chaenothecopsis viridialba* (Kremp.) A.F.W. Schmidt, *Cresponea chloroconia* (Tuck.) Egea & Torrente, *Lepraria crassissima* (Hue) Lettau *s. lat., Polycoccum minutulum* Kocourk. & F. Berger, *Rhizocarpon lavatum* (Fr.) Hazsl., *Rinodina adirondackii* H. Magn., *Trichonectria rubefaciens* (Ellis & Everh.) Diederich & Schr., *Vezdaea retigera* Poelt & Döbbeler.

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APPENDIX I

INDEX TO LOCALITIES

WESPI – USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, east of Mineral Spring Road along Loyalsock Creek, area around amphitheater. – elev. 1200 ft. – Lat. 41° 28' 12"N, Long. 76° 34' 07"W - Mixed northern hardwood forest with gradation from primarily *Acer, Fraxinus, Betula* to hemlock (*Tsuga*), with shaded boulders, on a north facing slope.

WESPII – USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, ca. ¼ mile from intersection with PA Route #154, along Mineral Spring Road. – elev. 1300 ft. – Lat. 41° 27' 52"N, Long. 76° 34' 40"W - Hemlock (*Tsuga*) dominated northern hardwood forest with abundant rock outcrops, on a north facing slope.

WESPIII – USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, ca. ½ mile from intersection with PA Route #154, along Mineral Spring Road. - elev. 1300 ft. – Lat. 41° 27' 41"N, Long. 76° 34' 44"W - Mixed northern hardwood forest dominated by *Acer*, with large rock outcrops, on a steep southwest facing slope.

WESPIV – USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, just north of Mineral Spring Road, Rock Garden. - elev. 1810 ft. – Lat. 41° 29' 39"N, Long. 76° 34' 05"W - High elevation mixed hardwood forest with sparse hemlock (*Tsuga*), with extensive large rock outcrops heavily visited by hikers.

WESPV – USA. PENNSYLVANIA. SULLIVAN CO.: Wyoming State Forest, along Cold Run Road ca. 2 miles from terminus. - elev. 1900 ft. – Lat. 41° 26' 05"N, Long. 76° 32' 53"W - Hemlock (*Tsuga*) dominated floodplain along Cold Run Creek with small sunny openings dominated by sedges and *Sphagnum*, bordered by a mixed hardwood forest (*Acer, Betula, Fraxinus*).

WESPVI- USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, east facing slope along PA Route #154, opposite Park Office and along Loyalsock Creek. – elev. ca. 1100 ft. - UTM 18 367800E 4592162N – Lat. 41° 28' 13"N, Long. 76° 35' 00"W – Moist

cliffside and rock wall along creek and east-slope with open forest of *Acer, Betula, Fraxinus, Tilia,* and *Tsuga* and sandstone outcrops/boulders.

WESPVII - USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, along Mineral Spring Road, ~0.5 miles from intersection with Cold Run Road. – ca. 1600 ft. - UTM 18 368109E 4589548N – Lat. 41° 26' 48"N, Long. 76° 34' 44"W – Narrow stream valley with sandstone outcrops and small waterfall, forested by *Betula* and *Tsuga.*

WESPVIII - USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, along Cold Run Road at intersection with PA Route #154, adjacent campground. – elev. ca. 1100 ft. - UTM 18 368771E 4591889N – Lat. 41° 28' 04"N, Long. 76° 34' 17"W – Wet seep / low swampy drainage with *Betula alleghenensis, Acer,* and large *Fraxinus.*

WESPIX - USA. PENNSYLVANIA. SULLIVAN CO.: Wyoming State Forest, along Rock Run / Loyalsock Road, just west of Soan Pond. – elev. 1800 ft. – UTM 18 372547E 4591685N - Lat. 41° 28' 00"N, Long. 76° 31' 35"W – Recently disturbed *Fraxinus/Acer* forest with small *Fraxinus* removed and with sparse *Tsuga.*

WESPX- USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, along Loyalsock Road, just below boundary of Wyoming State Forest. – elev. 1500-1600 ft. - UTM 18 367679E 4592759N – Lat. 41° 28' 32"N, Long. 76° 35' 05"W – Steep west-facing slope with extensive sandstone outcrops and boulders forested by *Betula, Fraxinus,* and *Tsuga.*

WESPXI - USA. PENNSYLVANIA. SULLIVAN CO.: Worlds End State Park, along PA Route #154, ca. 0.5 miles east of campground. – elev. ca. 1100 ft. – UTM 18 369943E 4591675N - Lat. 41° 27' 58"N, Long. 76° 33' 27"W – Open wet seep with *Betula alleghenensis* and *Tsuga* below steep north-facing slope with extensive sandstone boulders below and wet ledges above.

APPENDIX II

PRIMARY SUBSTRATES FOR SPECIES

	Corticolous (hardwoods)	Corticolous (conifers)	lichenicolous	lignicolous	muscicolous	saxicolous
Agonimia sp.					x	
Allocetraria oakesiana		x				
Amandinea polyspora	x					
Anaptychia palmulata	x					
Anisomeridium distans						x
Anisomeridium polypori		x				
Arthonia caesia	x					
Arthothelium ruanum	x					

Appendix II continued	(hardwoods)Corticolous	Corticolous (conifers)	lichenicolous	lignicolous	muscicolous	saxicolous
Bacidia schweinitzii	x					
Baeomyces rufus						x
Biatora longispora	x					
Biatora printzenii	x					
Bilimbia sabuletorum					x	
Caloplaca chrysodeta						x
Caloplaca feracissima						x
Cetrelia cetrarioides	x					
Chaenotheca brunneola				x		
Chaenothecopsis sp.				x		
Chaenothecopsis pusilla				x		
Chaenothecopsis viridialba				x		
Chrismofulvea dialyta		x				
Cladonia cristatella				x		
Cladonia furcata				x		
Cladonia grayi				x		
Cladonia incrassata				x		
Cladonia ochrochlora				x		
Cladonia parasitica				x		
Cladonia ramulosa				x		
Cladonia squamosa				x		
Coenogonium pineti				x		
Cresponea chloroconia		x				
Dictyocatenulata alba	x					
Endocarpon pallidulum						x
Evernia mesomorpha		x				
Flavoparmelia caperata	x					
Halecania rheophila						x
Hypocenomyce scalaris		x				
Hypogymnia physodes		x				

Appendix II continued	(hardwoods)Corticolous	Corticolous (conifers)	lichenicolous	lignicolous	muscicolous	saxicolous
Hypotrachyna showmanii	x	x				
Imshaugia aleurites		x				
Ionaspis lacustris						x
Lasallia papulosa						x
Lecanora cinereofusca	x					
Lecanora dispersa						x
Lecanora polytropa						x
Lecanora pulicaris	x					
Lecanora strobilina	x					
Lecanora thysanophora	x					
Lecidea ahlesii var. ahlesii						x
Lepraria caesiella	x					x
Lepraria crassissima						x
Lepraria lobificans	x					x
Lepraria neglecta						x
Lepraria normandinoides ined						x
Leptogium dactylinum					x	
Lithothelium hyalosporum	x					
Loxospora sp.						x
Loxospora pustulata	x					
Melanelixia fuliginosa	x					
Melanelixia subaurifera	x					
Micarea erratica						x
Micarea melaena				x		
Micarea peliocarpa				x		
Micarea prasina				x		
Mycocalicium subtile				x		
Myelochroa aurulenta	x					
Nadvornikia sorediata	x					
Ochrolechia arborea	x					
Opegrapha sp.*			x			
Parmelia squarrosa	x					

Appendix II continued	(hardwoods)Corticolous	Corticolous (conifers)	lichenicolous	lignicolous	muscicolous	saxicolous
Parmelia sulcata	x					
Peltigera evansiana				x		
Pertusaria sp.	x					
Pertusaria multipunctoides						x
Phaeocalicium polyporaeum				x		
Phaeophyscia adiastola						x
Phaeophyscia pusilloides	x					
Phaeophyscia rubropulchra	x					
Physcia stellaris	x					
Physcia subtilis						x
Phlyctis petraea						x
Placynthiella sp. ?				x		
Placynthiella icmalea				x		
Polycoccum minutulum*			x			
Porpidia albocaerulescens						x
Psilolechia lucida						x
Punctelia appalachensis		x				
Punctelia rudecta	x					
Punctelia subrudecta		x				
Pyrenula subelliptica	x					
Pyxine sorediata	x					
Rhizocarpon infernulum f. sylvaticum						x
Rhizocarpon lavatum						x
Rinodina adirondackii	x					
Rinodina subminuta	x					
Segestria leptalea		x				x
Stigmidium fuscatae			x			
Strigula stigmatella					x	
Trapelia coarctata						x
Trapelia placodioides						x
Trapeliopsis flexuosa				x		

Appendix II continued	(hardwoods)Corticolous	Corticolous (conifers)	lichenicolous	lignicolous	muscicolous	saxicolous
Trapeliopsis viridescens				x		
Trichonectria rubefaciens			x			
Trypethelium virens	x					
Umbilicaria mammulata						x
Verrucaria sp.						x
Vezdaea retigera				x		
Xanthoparmelia conspersa						x
Xanthoparmelia cumberlandia						x
Xanthoparmelia plittii						x
Lichenicole sp.*			x			
Sterile soreidate crust sp. 1	x					
Sterile sorediate cust sp. 2	x					
Sterile sorediate crust sp. 3						x
Sterile sorediate crust sp. 4	x					

Opuscula Philolichenum, 3: 65-68. 2006.

A Preliminary Glance at *Maronea* (Fuscideaceae) in North America

RICHARD C. HARRIS[1]

ABSTRACT. – Preliminary examination of North American material of *Maronea* A. Massal. found only a single species present, *M. polyphaea* H. Magn. *Maronea carolinae* H. Magn, *Maronea constans* var. *sublecideina* Zahlbr. ex Hasse, *Maronea constans* f. *incongrua* H. Magn., and *Maronea constans* f. *obscura* H. Magn. are placed in synonymy with *H. polyphaea*. The occurrence of *Maronea constans* (Nyl.) Hepp in North America is questioned.

While preparing a treatment of *Maronea* for the Ozark ecoregion it became clear that North American specimens differed chemically and morphologically from *M. constans*. Currently three species of *Maronea* are recognized in North America, *M. carolinae* H. Magn., *M. constans* (Nyl.) Hepp and *M. polyphaea* H. Magn. I believe that only a single species is present in North America since I have not been able to verify any specimens of *M. constans* and the other two names are synonymous. All material seen thus far is referable to a single species agreeing with the types of both *M. carolinae* and *M. polyphaea* which were published simultaneously in Magnusson's 1934 revision. I have chosen to adopt the epithet '*polyphaea*' since '*carolinae*' seems inappropriate for a widely distributed species. The description below is based mostly on Ozark material.

MARONEA A. Massal.
Flora 39: 291. 1856. Type (monotype): *M. berica* A. Massal. (= *Maronea constans* (Nyl.) Hepp)

Maronea polyphaea H. Magn., Acta Horti Gothob. 9: 59. 1934. TYPE: Nova Anglia, det. *Lecanora polyphaea* Tuck. [ined.], (H-Nyl 25989, not seen). ISOTYPE?: USA, Massachusetts. Middlesex County: Cambridge, *Tuckerman* (NY!).

Maronea constans var. *sublecideina* Zahlbr. *ex* Hasse, Bryologist 16:1. 1913. TYPE. USA, California, Santa Monica Mountains, above Sherman, on *Cercocarpus parvifolia* Nutt., Apr. 1912, *Hasse*, May 1912, *Hasse* (FH!, syntypes[2]).
Maronea carolinae H. Magn., Acta Horti Gothob. 9: 47. 1934. TYPE: USA, South Carolina, Aiken, on apple, *Ravenel* (FH!, holotype).
Maronea constans f. *incongrua* H. Magn., Acta Horti Gothob. 9: 55. 1934. TYPE: USA, Massachusetts, near Cambridge [Waltham, on beech trunks], [7] May 1893, *Burt* (FH!, lectotype[3] **selected here**; FH!, isolectotype).
Maronea constans f. *obscura* H. Magn., Acta Horti Gothob. 9: 56. 1934. Lectotype , selected here): USA, New York, Shushan, 1907, "*Fink*" [13 Apr 1907, *Frank Dobbin*, "Distributed by Bruce Fink"] (FH!, lectotype[3]; **selected here**; NY!, isolectotype).

Description: Thalli mostly occurring as small, separate patches, mostly less than 1 cm in longest dimension, occasionally several fusing, gray-green, matt, continuous, rugose or ± bullate, to 150 µm thick; prothallus sparse, white or not evident; cortex colorless, amorphous to weakly cellular, thin, ca. 10-15 m

[1]Richard C. Harris: Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458-5126, USA.
[2] As usual Hasse types are a problem and lectotypification requires further study.
[3] Annotated as "Typus" by Magnusson but not published as such.

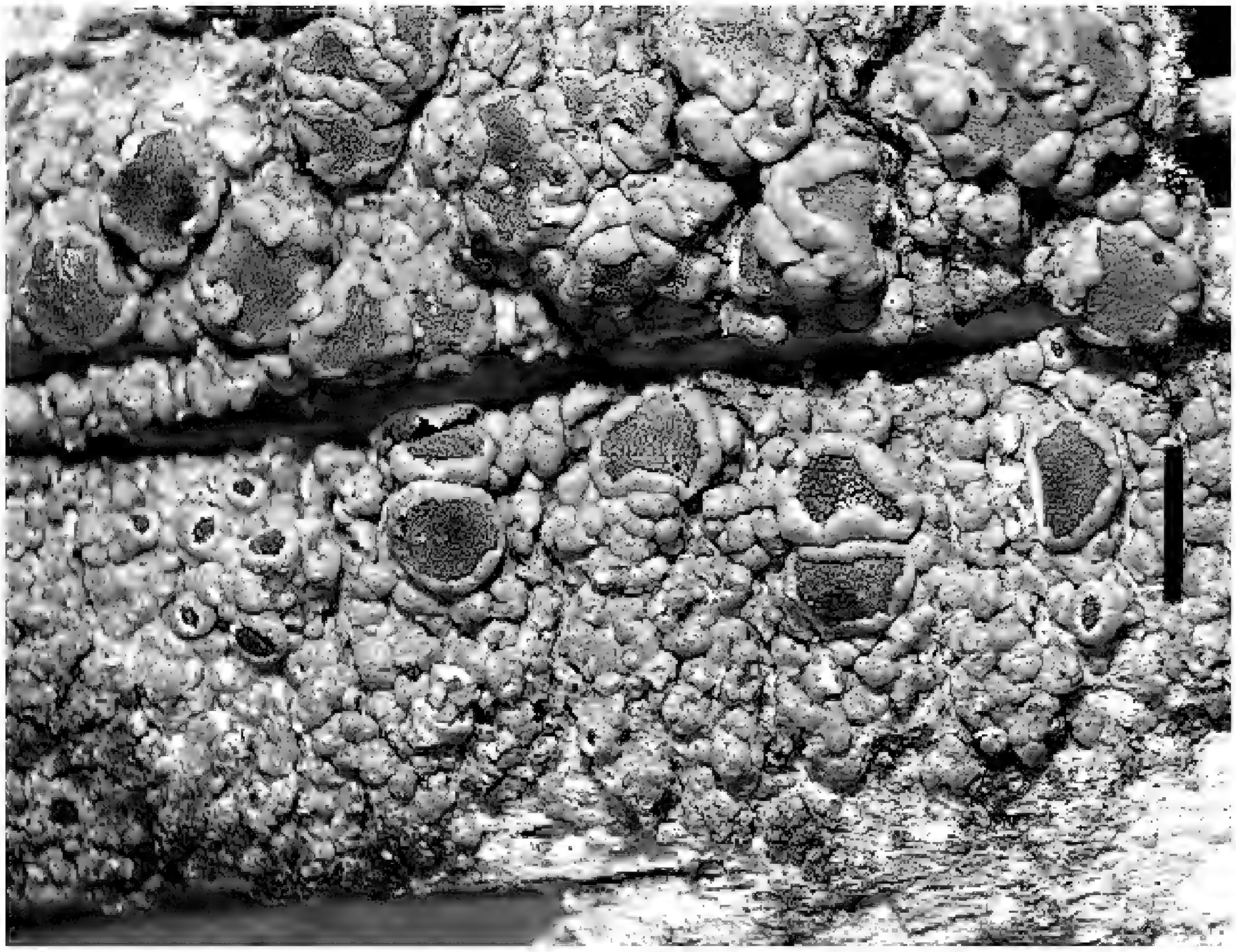

Fig. 1 Maronea polyphaea (Arkansas, Izard Co., *Buck 40225*, NY); scale bar = 1.0 mm.

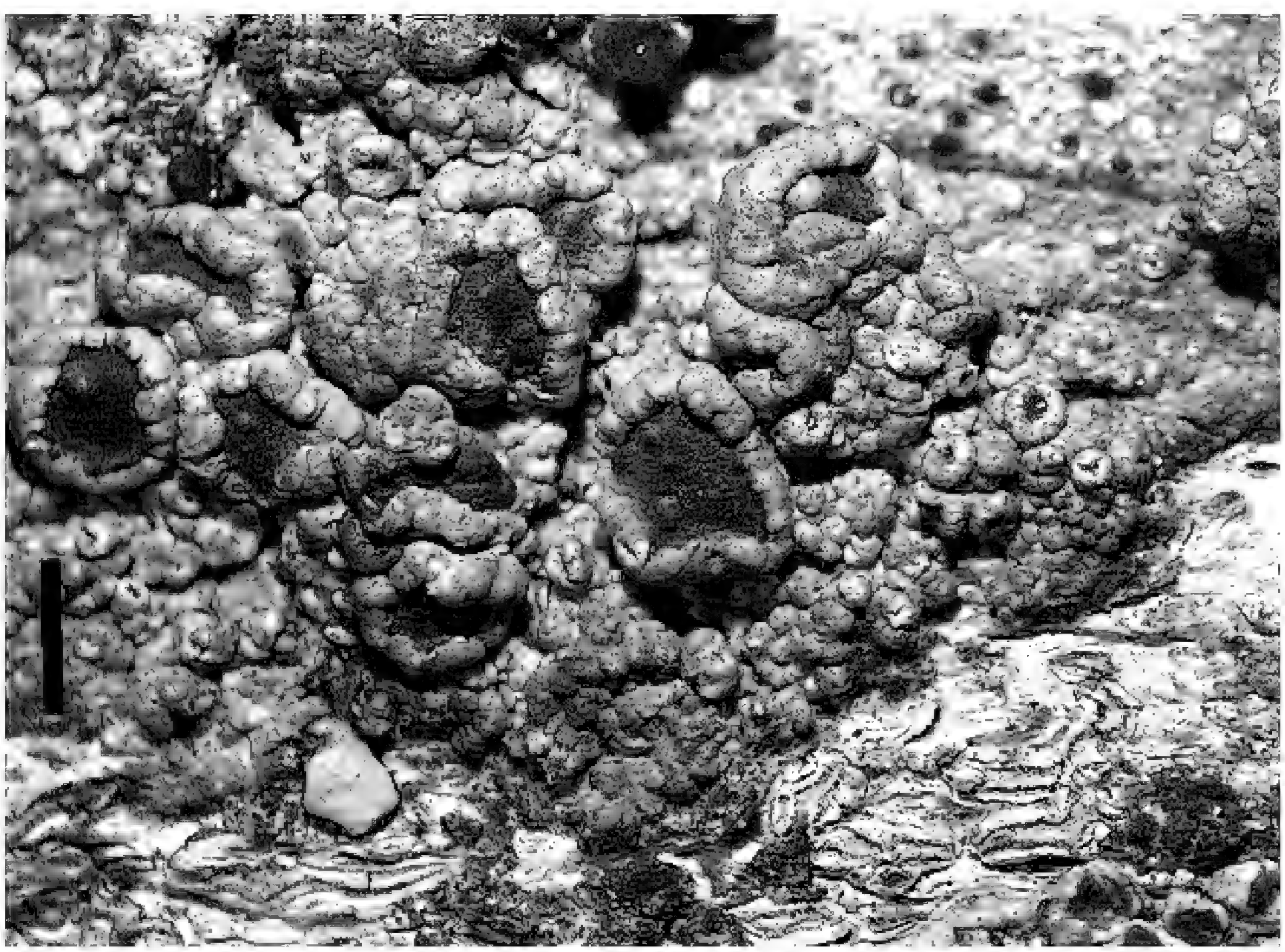

Fig. 2 Maronea constans (Switzerland, An Buchen bei Liestal, *Hepp* s.n., NY); scale bar = 1.0 mm.

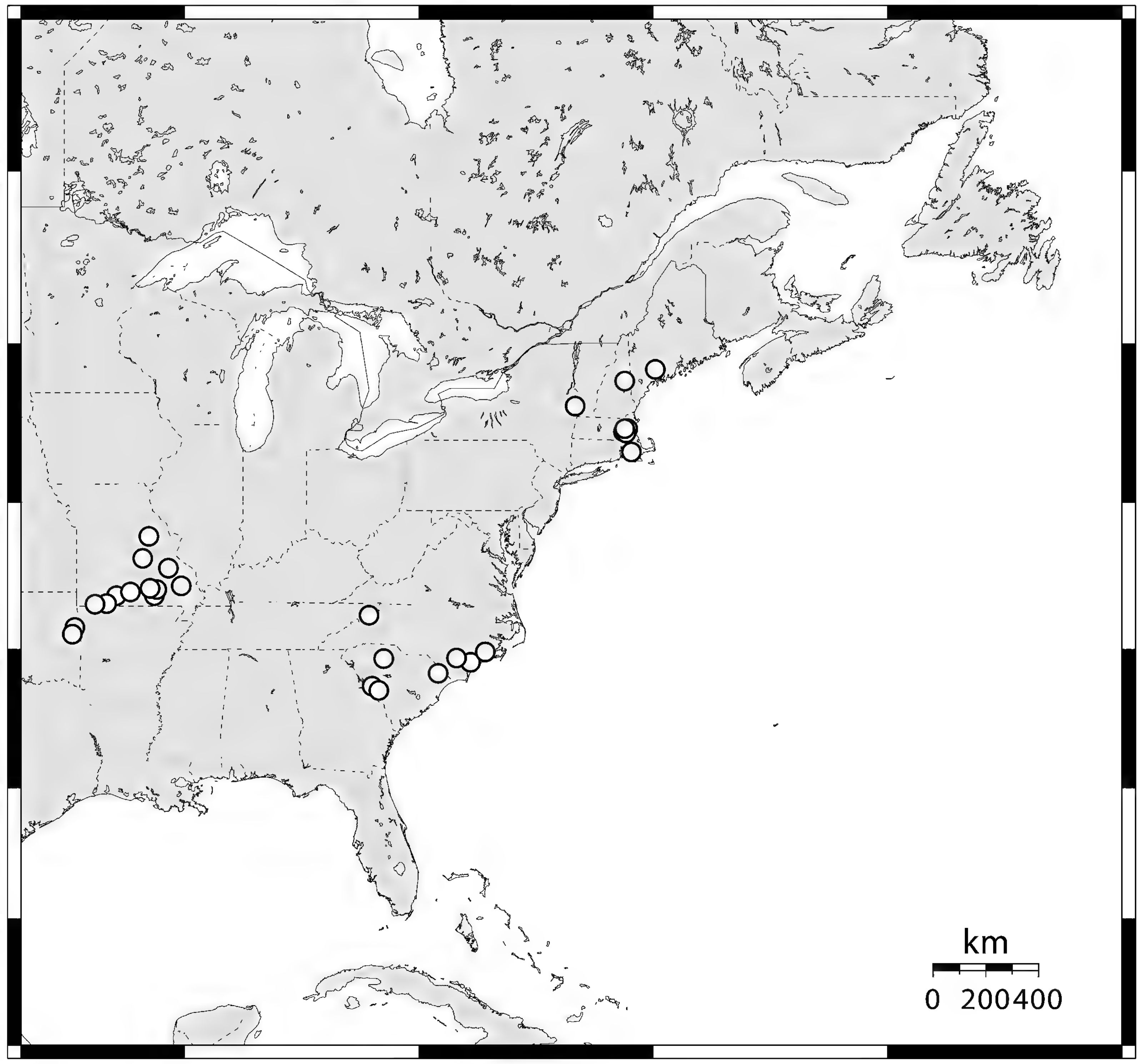

Fig. 3. Distribution of *M. polyphaea* in eastern North America based on specimens in FH and NY.

thick; medulla white, KOH-, C-, KC+ red, PD- or yellowish (alectorialic acid; reactions sometimes spotty and variable in intensity, especially in specimens from shade which apparently have lower concentrations of lichen acids). Apothecia sessile, crowded to scattered, 0.5-1.0 mm across; disk dark brown, with sparse, ± coarse, white pruina; margin rather thick, raised, concolorous with thallus, with cellular cortex, ca. 25-35 µm thick, with distinct white medulla, and with medulla/algal layer 50-75 µm thick. Hymenium not inspersed, ca. 70-90 µm thick, colorless below, upper ca. 20 µm olive-brown (some pigment in gel matrix, with thin sheath of paraphysis tips darker brown). Paraphyses irregular, branched, easily separable, with tips intricately intertwined forming ± distinct epihymenium of short, very irregular branches, with cells ± enlarged. Asci *Fuscidea*-type, cylindrical to weakly obclavate, 60-80 x 15-20 µm with many spores. Ascospores broadly ellipsoid or ± oblong, sometimes pinched in the middle (as in some other Fuscideaceae), 4-6 x 2.5-4 µm. Pycnidia colorless, immersed, ± globose, ca. 0.1 mm across. Conidia fusiform or narrowly ellipsoid, 3 x 1.5 µm.

Discussion: Maronea polyphaea has been and is most likely to be confused initially with species of *Rinodina*. Under the dissecting microscope a quick KC test on the stark white medulla (apothecial medulla often gives the best reaction) will identify *Maronea polyphaea* as there is no North American *Rinodina* on bark which reacts KC+ red. A section of the apothecium, of course, will reveal colorless, nonseptate ascospores, many to the ascus in *Maronea* vs. brown and septate in *Rinodina. Maronea constans* differs from *M. polyphaea* in being generally larger in all respects, in having an inspersed hymenium, and in

containing divaricatic acid (TLC). Additional material will have to be investigated to confirm the presence or absence of *M. constans* in North America. I suggest *M. constans* be retained in the North American checklist pending confirmation of its presence, noting that it may be based on misidentifications.

The material from California described by Hasse as *M. constans* var. *sublecideina* is rather poor but is here considered conspecific with eastern material pending discovery and study of additional western material. Magnusson (1934) did not regard this varietal name as validly published and did not treat it in full.

Maronea polyphaea is widely distributed in eastern North America has been seen from New Hampshire and Maine south to South Carolina and northern Alabama, Kentucky and the Ozarks. Interestingly it has not yet been seen from west of the Appalachians north of the Kentucky-Ozark axis nor are there any recent collections north of Kentucky and Tennessee. In the West it is known to me only from the Hasse collections cited above. The syntype of *M. constans* f. *obscura* cited by Magnusson as "Sitchfield, Washington" is actually from Litchfield, Maine (Magnusson frequently misread handwritten labels from North America.) It is common in the Ozarks, perhaps mostly a pioneer species, on twigs and branches of deciduous trees and shrubs with a few collections from boles. Many of the collections, both in the Ozarks and elsewhere, come from open, acid glades but it has also been collected in more continuous forest types.

ACKNOWLEDGEMENTS

Scott LaGreca is thanked for the loan of FH specimens. James Lendemer is thanked for producing the distribution map. Cliff Wetmore and Goran Thor provided peer reviews.

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Opuscula Philolichenum, **3**: 69-78. 2006.

Contributions to the Lichen Flora of Pennsylvania: Additions to the Checklist of Lichens of the Delaware Water Gap National Recreation Area

RICHARD C. HARRIS[1] & JAMES C. LENDEMER[2]

ABSTRACT. – An account of the lichens collected by the participants of the 30th A. Leroy Andrews Foray to the Delaware Water Gap National Recreation Area is provided. This contribution supplements the report of Water Gap lichens previously compiled by the authors. *Bacidia phyllopsoropsis* is described as new to science.

The 30th A. Leroy Andrews Foray was held in the Delaware Water Gap National Recreation Area (abbreviated DWGNRA), Pennsylvania. The participants collected in the vicinity of Community Drive Wetlands and the Pocono Environmental Education Center (PEEC) on 16-18 September 2005. Both localities were visited previously by the authors as part of the 1st Howard Crum Bryological Workshop in 2004. Checklists were included in the report of the lichens collected during that workshop (Harris & Lendemer 2005). The temptation to test the completeness of the published list proved too great for the participants of the Andrews Foray, who made a number of additional finds which are reported here. Whereas previous foray reports have included complete checklists, we have chosen to include only new reports from the localities that were visited during the foray. In an effort to present this report in a more comprehensive and useful format we have chosen to divide it into the following sections: I) New reports for each locality (following the format of our previous report). II) New reports for the DWGNRA. III) Discussion of the implication of these reports on the flora of the DWGNRA as well as that of Pennsylvania as a whole.

I. ADDITIONS TO HARRIS & LENDEMER (2005)

The format of the checklist below follows that of our previous report (Harris & Lendemer 2005). The majority of collections cited below are those of W.R. Buck (NY), R.C. Harris (NY), and J.C. Lendemer (hb Lendemer, duplicates in NY). Duplicates of collections made by others that are also cited here have been deposited in NY. Lichenicolous fungi are indicated by an asterisk (*).

UNITED STATES OF AMERICA. PENNSYLVANIA. MONROE COUNTY.: Delaware Water Gap National Recreation Area, ca. 2 miles south of Bushkill, ca. 1 mile southeast of Shoemakers, Community Drive Wetlands. - elev. ca. 700-800 ft. – Lat. 41° 04' 43"N, Long. 75° 00' 24"W. - Drained portions bordered by *Alnus,* and swampy portions primarily with *Acer* and *Fraxinus*, bisected by Hogback Ridge forested with dense hemlocks (*Tsuga*) and large semi-calcareous rock exposures and boulders - 17September2005

[1] Richard C. Harris: Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458-5126, USA.
[2] James C. Lendemer: Department of Botany, The Academy of Natural Sciences of Philadelphia, 1900 Benjamin Franklin Pky., Philadelphia, PA, 19103, USA. – email: lendemer@acnatsci.org

Arthonia helvola Nyl. – *Lendemer 5016.*
Arthonia s. lat. sp. – *Lendemer5036.*

The above collection occurred on the bark of a hemlock (*Tsuga canadensis*) associated with *Chrysothrix flavovirens,* on the margins of an open maple swamp. The taxon is characterized as follows: tiny, subglobose, whitish ascomata possibly associated with chlorococcoid algae. All tissues colorless. Interascal hyphae much branched and anastomosed. Hymenial gel K/I+ medium blue. Asci *Arthonia*-type, broadly clavate with tiny K/I+ apical ring with 8, irregularly arranged spores. Ascospores colorless, 3-septate, fusiform, 14-18 x 3-4 µm. The ascus type places this species in a broad concept of *Arthonia* but the pale ascomata, weak I-reaction and narrow, fusiform ascospores are anomalous for the majority of species of the genus.

Bacidia phyllopsoropsis R. C. Harris & Lendemer ***sp. nov.*** (see appendix, figs. 1-6) - *Buck 49265, Buck 49278, Buck 49311.*
Bacidia coprodes (Körb.) Lettau – *Buck 49308.*
Biatora printzenii Tønsberg – *Harris 5162.*
Bilimbia sabuletorum (Schreb.) Arnold – *Lendemer 5032.*
Candelaria concolor (Dicks.) Stein – *Guccion 566.*
Cladonia sobolescens Nyl. *ex* Vainio – *Lendemer 4966.*
Dictyocatenulata alba Finley & E.F. Morris – *Lendemer 5021.*
Graphis scripta (L.) Ach. – *Harris 51620.*
Julella fallaciosa (Stizenb. *ex* Arnold) R.C. Harris – *Lendemer 5019.*
Lecania subfuscula (Nyl.) S. Ekman ? – *Buck 49276.*

The above collection was named using Purvis et al. (1992), but unfortunately we lack comparative material.

Lecidea hypnorum Libert – *Harris 51626.*
Lepraria neglecta (Nyl.) Lettau – psoromic acid chemotype – *Harris* 51614 (on upper bole of fallen red oak), Harris *51623* (on rock).
Lithothelium hyalosporum (Nyl.) Aptroot – *Lendemer 5006.*
Marchandiomyces corallinus (Roberge) Diederich & D. Hawksw.* (thallus of *Flavoparmelia caperata*) – *Harris 51625.*
Melanelixia fuliginosa (Fr. *ex* Duby) O. Blanco et al. – *Lendemer 5023.*
Melaspilea sp. 1* (on depauperate *Bacidia schweinitzii*) – *Harris 51610.*
Micarea prasina Fr. – *Harris 51619, Lendemer 5069.*
Nectriopsis parmeliae (Berk. & Curtis) M. S. Cole & D. Hawksw.* (on *Punctelia rudecta) – Harris 51618.*
Nectriopsis rubefaciens (Ellis & Everh.) M. S. Cole & D. Hawksw.* ? – *Lendemer 5069-A* (on *Micarea prasina*).

The host is anomalous but the material seems otherwise indistinguishable from *N. rubefaciens*, which normally occurs on members of the Parmeliaceae.

Parmotrema hypotropum (Nyl.) Hale – *Guccion 569.*
Pertusaria globularis (Ach.) Tuck. – *Harris 51624.*
Physcia pumilior R.C. Harris – *Guccion 568.*

The report of this species was inadvertently omitted from Harris & Lendemer (2005). These collections represent the northernmost report for the species (see Lendemer 2006).

Physcia stellaris (L.) Nyl. – *Lendemer 5020.*
Physconia detersa (Nyl.) Poelt – *Guccion 567*, *Lendemer 5018.*
Placynthiella dasaea (Stirton) Tønsberg – *Buck 49271.*
Pyrrhospora varians (Ach.) R.C. Harris – *Buck 49303.*
Rinodina willeyi Sheard & Giralt – *Harris 51610-A.*
Staurothele diffractella (Nyl.) Tuck. – *Buck 49270.*
Thelocarpon sp. – *Buck 49274*

The above collection is rather poor and the taxon possibly undescribed: ascomata pallid with apical pruina; paraphyses absent; hymenial gel and ascus sheath I–; ascospores ca. 3 x 1.6-1.8 µm; on HCl– rock.

Usnea hirta (L.) F.H. Wigg. – *Lendemer 4963.*
Sterile sorediate crust sp. 11 (TLC: atranorin; saxicolous, thallus thick, blue-gray, verruculous, blastidiate/granulose). – *Lendemer 4961.*

Sterile sorediate crust sp. 12 (TLC: no lichen substances detected; saxicolous, thallus sub-squamulose, forming small rosettes, brown-gray, soralia laminal, with greenish-white soralia, pycnidia present, conidia hyaline, ellipsoid, simple). – *Lendemer 4977, Lendemer 5012.*
Sterile sorediate crust sp. 18 (TLC: no substances detected; corticolous, thallus green, continuous, soralia minute, somewhat diffuse with age) – *Lendemer 5664.*

UNITED STATES OF AMERICA. PENNSYLVANIA. PIKE COUNTY.: Delaware Water Gap National Recreation Area, Pocono Environmental Education Center. – elev. ca. 750 ft. – Lat. 41° 10' 05"N, Long. 74° 54' 34"W. - Upland pine (*Pinus*) - oak (*Quercus*) dominated forest with exposed east facing slopes, small maple (*Acer*) swamp with *Sphagnum* drainage, and shale barrens forested by *Juniperus* and *Pinus.* - 18September2005

Acarospora fuscata (Nyl.) Arn. – *Buck 49328, Harris 51794, Lendemer 5068.*
Allocetraria oakesiana (Tuck.) Randlane & A. Thell – *Lendemer 5017.*
Acrocordia megalospora (Fink) R.C. Harris – *Lendemer 5033*, *Olszewski 6247Bb.*
Anisomeridium polypori (Ellis & Everh.) R.C. Harris – *Lendemer 5060.*
Aspicilia cinerea (L.) Körb. *s. lat.* – *Buck 49349, Lendemer 5661.*
Aspcilia laevata (Ach.) Arnold – *Lendemer 5661-A.*
Bacidia schweinitzii (Fr. *ex* Michener) A. Schneid. – *Lendemer 5058*
Candelariella efflorescens R. C. Harris & Buck – *Buck 49342* (sterile).
Chrismofulvea dialyta (Nyl.) Marbach – *Buck 49315*, *Harris 51795*
Cladonia apodocarpa Robbins – *Lendemer 5051.*
Cladonia cristatella Tuck. – *Harris 51796, Lendemer 5054.*
Cladonia dimorphoclada Robbins – *Lendemer 4975.*
Cladonia grayi G. Merr. *ex* Sandst. – *Harris 51799, Lendemer 5053.*
Cladonia incrassata Flörke – *Lendemer 5044.*
Cladonia macilenta Hoffm. var. *bacillaris* – *Lendemer 4965.*
Cladonia macilenta Hoffm. var. *macilenta* – *Harris 51800.*
Two podetia only, growing mixed with *C. macilenta* var. *bacillaris*. Perhaps such proximity supports the view that these are only chemotypes unworthy of taxonomic recognition.
Cladonia ochrochlora Flörke – *Lendemer 5005.*
Cladonia parasitica (Hoffm.) Hoffm. – *Lendemer 5052.*
Cladonia robbinsii Evans – *Harris 51802, Lendemer 5055.*
Cladonia strepsilis (Ach.) Grognot – *Harris 51803*
Cladonia uncialis (L.) F.H. Wigg. (squamatic acid chemotype) – *Harris 51805, Lendemer 5050.*
Dactylospora pertusariicola (Willey *ex* Tuck.) Hafellner* (on *Pertusaria plittiana*) – *Lendemer 5066*
Dimelaena oreina (Ach.) Norman – *Lendemer 5076.*
Fuscidea arboricola Coppins & Tønsberg – *Harris 51812.*
Heterodermia speciosa (Nyl.) Trev. – *Lendemer 5039.*
Hypocenomyce scalaris (Ach.) M. Choisy – *Harris 51603.*
Hypogymnia physodes (L.) Nyl. – *Harris 51806, Lendemer 5031.*
Hypotrachyna livida (Taylor) Hale – *Harris 51807, Lendemer 5040.*
Hypotrachyna showmanii Hale – *Lendemer 5038.*
The reports of *Parmelinopsis spumosa* ?, by Harris & Lendemer (2005) belong here.
Imshaugia aleurites (Ach.) S. F. Meyer – *Guccion 570.*
Ionaspis lacustris (With.) Lutzoni – *Harris 51606.*
Lecanora hybocarpa (Tuck.) Brodo – *Lendemer 5065.*
Lecanora minutella Nyl. – *Buck 49344.*
Lecanora perplexa Brodo – *Lendemer 5044.*
Lecanora symmicta (Ach.) Ach. – *Harris 51808, Lendemer 5042, Lendemer 5067.*
Lecanora thysanophora R.C. Harris – *Lendemer 5087.*
Lecidea cyrtidia Tuck. – *Buck 49350, Harris 51608, Lendemer 5070.*
Lepraria caesiella R.C. Harris – *Lendemer 5089.*
Lepraria caesioalba (de Lesd.) J.R. Laundon – *Harris 51809, Harris 51810.*
Lepraria neglecta (Nyl.) Erichsen – *Lendemer 5007, Lendemer 5030.*

Leptogium cyanescens (Rabenh.) Körb. – *Lendemer 5026, Lendemer 5003.*
Melanelixia fuliginosa (Fr. *ex* Duby) O. Blanco et al. – *Harris 51811*
Melanelixia subaurifera (Nyl.) O. Blanco et al. – *Buck 49336*.
Melaspilea sp. ? 2* (on *Lecanora cf. perplexa*) – *Lendemer 5022.*
Micarea erratica (Körber) Hertel et al. – *Harris 51604.*
Micarea melaena (Nyl.) Hedl. – *Lendemer 5048.*
Muellerella pygmaea (Körber) D. Hawksw. var. *athallina* (Müll. Arg.) Triebel* – *Harris 51818* (on *Rhizocarpon rubescens*).
Mycocalicium subtile (Pers.) Szatala – *Buck 49325*.
Nectriopsis parmeliae (Berk. & M.A. Curtis) M.S. Cole & D. Hawksw.* – *Harris 51813, Lendemer 5046* (on *Parmelia sulcata*), *Lendemer 5049* (on *Ochrolechia arborea*), *Lendemer 5080* (on *Punctelia rudecta*), *Harris 51814* (on *Xanthoparmelia plittii*).

This species does not appear to have previously been reported from *Ochrolechia arborea.*

Nectriopsis rubefaciens (Ellis & Everh.) M. S. Cole & D. Hawksw.* – *Buck 49327* (on *Flavoparmelia caperata*, *Parmelia sulcata* and *Punctelia subrudecta*).

All three host species growing close together, apparently a rather promiscuous parasite.

Nephroma helveticum Ach. – *Lendemer 5025.*
Peltigera evansiana Gyelnik – *Lendemer 5004.*
Pertusaria plittiana Erichsen – *Lendemer 5077.*
Pertusaria pustulata (Ach.) Duby – *Lendemer 5075.*
Phaeocalicium polyporaeum (Nyl.) Tibell – *Lendemer 5072.*
Physcia millegrana Degel. – *Buck 49343*.
Physcia subtilis Degel. – *Guccion 571, Lendemer 5002.*
Placynthiella icmalea (Ach.) Coppins & P. James – *Buck 49337* (on soil).
Porpidia sp. – *Lendemer 4962.*

The above collection consists of a small sorediate thallus with several immature ascomata. The material contains the stictic acid complex (TLC, JCL) and has been sent to Alan Fryday for further study.

Porpidia albocaerulescens (Wulfen) Hertel & Knoph var. polycarpiza (Vain.) Rambold & Hertel – *Lendemer 4976.*

All our other collections of *P. albocaerulescens* from the Water Gap represent the stictic acid chemotype. The presence of norstictic acid in the above collection was confirmed with TLC (JCL). While filing specimens at NY an additional Water Gap collection of this taxon was found[3].

Porpidia crustulata (Ach.) Hertel & Knoph – *Buck 49337, Guccion 573, Harris 51605, Harris 51815.*
Pronectria sp.* – *Buck 49312* (on *Flavoparmelia caperata*).

The combination of ascospore size, ascospore arrangement and host do not seem to lead to a name. The ascospores are irregularly arranged in the ascus, fusiform, ca. 15 x 3.7 µm.

Punctelia subrudecta auct. Amer. – *Guccion 574, Lendemer 5035.*
Rhizocarpon infernulum f. *sylvaticum* Fryday – *Guccion 575, Lendemer 5011.*
Rhizocarpon reductum Th. Fr. – *Buck 49347*.
Rhizocarpon rubescens Th. Fr. – *Harris 51816, Lendemer 5064.*
Rhizoplaca subdiscrepans (Nyl.) R. Sant. – *Buck 49331, Lendemer 5078.*
Rimularia badioatra (Kremp.) Hertel & Rambold – *Buck 49331B* [with *Merismatium peregrinum* (Flotow) Triebel, as in previous report].
Rinodina sp. 2 – *Lendemer 5045, Lendemer 5074.*

The material has a minutely bullate thallus becoming continuous and thick, *Pachysporia*-type ascospores, and contains atranorin (TLC, JCL).

Rinodina oxydata (A. Massal.) A. Massal. – *Lendemer 5010.*
Roselliniella cladoniae (Anzi) Matzer & Hafellner* (on thallus of *Cladonia ochrochlora*) – *Lendemer 5009.*
Scoliciosporum chlorococcum (Stenh.) Vězda – *Buck 49335.*
Scoliciosporum umbrinum (Ach.) Arn. – *Lendemer 5071*[*?].

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[3] *Porpidia albocaerulescens* (Wulfen) Hertel & Knoph *var. polycarpiza* (Vain.) Rambold & Hertel – USA. NEW JERSEY. WARREN CO.: Delaware Water Gap, near Dunfield Creek trail, on exposed limestone [sic] rock near trail, 26.iv.1975, *Prince 75-24* (NY!).

The above collection is apparently initially lichenicolous on *Porpidia albocaerulescens*. A number of thalli of *S. umbrinum* with similar ecology were observed at this locality.

Sphinctrina tubiformis A. Massal.* (on *Pertusaria plittiana*) - *Lendemer 5028.*

Trapelia glebulosa (Sw.) J.R. Laundon – *Buck 49348.*

Trapelia placodioides Coppins & P. James – *Lendemer 5029.*

Trapeliopsis sp. - *Lendemer 5662.*

The above collection could possibly be referred to *T. granulosa* however is saxicolous and dispersed areolate with the soralia erupting out of the areoles.

Trapeliopsis flexuosa (Fr.) Coppins & P. James – *Harris 51817.*

Trapeliopsis granulosa (Hoffm.) Lumbsch – *Lendemer 5059, Lendemer 5061.*

Tuckermanopsis americana (Sprengl.) Hale – *Olszewski 6283.*

Vouauxiella lichenicola (Linds.) Petrak & H. Sydow* (on thallus and apothecia of *Lecanora hybocarpa*) – *Lendemer 5065-A.*

Vouauxiomyces truncatus (de Lesd.) Dyko & D. Hawksw.* ? – *Buck 49331A* (on *Xanthoparmelia angustiphylla*).

Cole and Hawksworth (2001) described *Abrothallus tulasnei* from material on *Xanthoparmelia* but its conidia are described as (9.5)11-14.5(-19) x (3.5)4-5(-6.5) µm. Conidia in this specimen are 8-9.2 x 4.8-5.4 µm, a conidial size usually referred to *Vouauxiomyces truncatus,* the anamorph of *Abrothallus microspermus* Tul. *Abrothallus* is obviously a fertile field for study.

Xanthoparmelia angustiphylla (Gyelnik) Hale – *Lendemer 4973.*

Sterile sorediate crust sp. 5 – Lendemer 4974.

Sterile soredate crust sp. 13 (TLC: usnic acid, zeorin; corticolous, thallus continuous granulose-sorediate, blue-gray). – *Lendemer 4970.*

Sterile sorediate crust sp. 14 (TLC: atranorin, zeorin; corticolous, thallus thin, continuous, with well defined blue-gray soralia eventually becoming diffuse and continuous). – *Lendemer 4975.*

Sterile sorediate crust sp. 16 (TLC: fumarprotocetraric acid?; corticolous, thallus thin, greenish, shiny, with colorless prothallus, soralia distinct, bright green). – *Lendemer 5088.*

Sterile sorediate crust sp. 17 (TLC: atranorin; corticolous/muscicolous, thallus thin, soralia diffuse green) – *Lendemer 5081.*

Sterile sorediate sp. 17 is apparently not uncommon in the region, a number of additional collections[4], cited below, have been made in southern New Jersey and elsewhere in eastern Pennsylvania.

Sterile sorediate crust sp. 19 (TLC: no substances detected; lignicolous/muscicolous, thallus scant/poorly developed, soralia diffuse and becoming continuous, greenish) – *Lendemer 5663.*

II. NEW REPORTS FOR THE DWGNRA

The following taxa from the above section represent new reports for the DWGNRA.

Acrocordia megalospora (Fink) R.C. Harris
Arthonia helvola Nyl.
Arthonia sp. *s. lat.*
Bacidia coprodes (Körb.) Lettau
Bacidia phyllopsoropsis R.C. Harris & Lendemer *sp. nov.*
Biatora pycnidiata Printzen & Tønsberg[5]

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4 *Sterile sorediate sp. 17* – USA. NEW JERSEY. BURLINGTON CO.: Wharton State Forest, west shore of the Skit Branch of the Batsto River, *J.C. Lendemer 3508 & R.F. Lendemer* (NY!, hbL!); Wharton State Forest, south of Batsto, *J.C. Lendemer 3283* (hbL!); Wharton State Forest, 0-1 mile north of Batsto, *J.C Lendemer 3177* (NY!, hbL!). CUMBERLAND CO.: Edward Bevin Wildlife Management Area, N of railroad tracks crossing NJ Route #555, *J.C. Lendemer 1933 & J.A. Macklin* (NY!, hbL!). PENNSYLVANIA. LANCASTER CO.: ca. 1 mile SW of Lees Bridge, *J.C. Lendemer 4492 & A.E. Schuyler* (hbL!).

5 This recently described species was reported by Printzen and Tønsberg (2004) from the New Jersey side of the park: USA. NEW JERSEY. Sussex County: 3 mi S of Wallpack Center, on steep hill overlooking Delaware River, 1986, *Wetmore 56490* (M).

Candelariella efflorescens R.C. Harris & Buck
Cladonia apodocarpa Robbins
Cladonia dimorphoclada Robbins
Cladonia parasitica (Hoffm.) Hoffm.
Cladonia robbinsii Evans
Cladonia sobolescens Nyl. *ex* Vainio
Cladonia strepsilis (Ach.) Grognot
Dactylospora pertusariicola (Willey *ex* Tuck) Hafellner*
Dimelaena oreina (Ach.) Norman
Fuscidea arboricola Coppins & Tønsberg
Hypotrachyna livida (Taylor) Hale
Ionaspis lacustris (With.) Lutzoni
Julella fallaciosa (Stizenb. *ex* Arnold) R.C. Harris
Lecanora hybocarpa (Tuck.) Brodo
Lecanora minutella Nyl.
Lecania subfuscula (Nyl.) S. Ekman ?
Lecidea hypnorum Libert
Lepraria neglecta (Nyl.) Lettau [psoromic acid chemotype]
Lithothelium hyalosporum (Nyl.) Aptroot
Marchandiomyces corallinus (Roberge) Diederich & D. Hawksw.*
Melanelixia fuliginosa (Fr. *ex* Duby) O. Blanco et al.
Melaspilea sp. 1*
Melaspilea sp. ? 2*
Micarea melaena (Nyl.) Hedl.
Micarea prasina Fr.
Muellerella pygmaea (Körber) D. Hawksw. var. *athallina* (Müll. Arg.) Triebel*
Nectriopsis parmeliae (Berk. & Curtis) M. S. Cole & D. Hawksw.*
Nectriopsis rubefaciens (Ellis & Everh.) M. S. Cole & D. Hawksw.*
Nephroma helveticum Ach.
Parmotrema hypotropum (Nyl.) Hale
Pertusaria globularis (Ach.) Tuck.
Pertusaria plittiana Erichsen
[*Physcia pumilior* R.C. Harris]
Physcia stellaris (L.) Nyl.
Physcia subtilis Degel.
Physconia detersa (Nyl.) Poelt
Placynthiella dasaea (Stirton) Tønsberg
Placynthiella icmalea (Ach.) Coppins & P. James[6]
Porpidia sp.
Porpidia albocaerulescens (Wulfen) Hertel & Knoph var. polycarpiza (Vain.) Rambold & Hertel
Pronectria sp.*
Rhizocarpon rubescens Th. Fr.
Rhizoplaca subdiscrepans (Nyl.) R. Sant.
Rinodina sp. 2
Rinodina willeyi Sheard & Giralt
Roselliniella cladoniae (Anzi) Matzer & Hafellner*
Sphinctrina tubiformis A. Massal.*
Thelocarpon sp.
Trapeliopsis sp. - *Lendemer 5662.*
Trapeliopsis granulosa (Hoffm.) Lumbsch
Usnea hirta (L.) F.H. Wigg.
Vouauxiella lichenicola (Linds.) Petrak & H. Sydow*
Vouauxiomyces truncatus (de Lesd.) Dyko & D. Hawksw.*
Sterile sorediate crust 11

[6] Previous reported by Harris & Lendemer (2005) as a substrate for *Dactylospora lurida* Hafellner.

Sterile sorediate crust 12
Sterile sorediate crust 13
Sterile sorediate crust 14
Sterile sorediate crust 16
Sterile sorediate crust 17
Sterile sorediate crust 18
Sterile sorediate crust 19

Names Changes for Taxa Already Reported:

Caloplaca sp. = *Caloplaca oxfordensis* Fink *ex* J. Hedrick
Lecidea ahlesii (Körb.) Nyl. = *Lecidea ahlesii* (Körb.) Nyl. var. *nemoralis* (J. Lowe) *ined.*
Myxobilimbia sabuletorum (Schreb.) Hafellner = *Bilimbia sabuletorum* (Schreb.) Arnold
Parmelinopsis spumosa (Asah.) Elix & Hale ? = *Hypotrachyna showmanii* Hale
Trapelia involuta (Taylor) Hertel = *Trapelia glebulosa* (Sw.) J.R. Laundon
Xanthoparmelia somloensis (Gyelnik) Hale = *Xanthoparmelia viriduloumbrina* (Gyelnik) Lendemer

III. DISCUSSION

Prior to our contributions the lichen flora of the park was already among the most diverse in the United States (Bennett & Wetmore 2005). Even though Bennett & Wetmore's article had not been published when we began to compile our previous report of DWGNRA lichens (Harris & Lendemer 2005), we were astounded by the diversity of lichens in the park. The previous report included 209 species, of which many were newly reported for the state, two were newly reported for North America, and many apparently represented undescribed taxa of which two have subsequently been formally described (Harris & Lendemer 2005, Lendemer 2005). The opportunity to collect again in such a diverse area, especially with the many participants of the A. Leroy Andrews Foray, provided a rare chance to test the checklist we had compiled only a year ago. The fact that the foray would visit only localities *already* covered by the checklist piqued our interest even more. Though when we published the previous checklist, we expected “additional intensive collecting would likely significantly add” to the list, we did not expect the large number of additions reported here from localities we had already visited. This latest contribution should be considered a supplement to our previous checklist and reports an additional sixty four taxa [!] from the park. Though many of the newly reported taxa are inconspicuous crustose taxa, which are often ignored or overlooked in the field, a significant number of them are conspicuous macrolichens. It should be noted that a rather large number of the new reports also represent lichenicolous fungi, another group often overlooked in the field.

Since the seemingly remarkable diversity of lichens in the DWGNRA is based on truly minimal collection time, one immediate conclusion that can be drawn is that an intensive survey of DWGNRA lichens is desperately needed. Additionally, since the lichens listed in Bennett & Wetmore (2005) were collected in 1986, a resurvey would provide an important opportunity to evaluate the changes in lichen diversity after 20+ years. Moreover, in order to properly evaluate the uniqueness of DWGNRA, a similar intensity of collecting is needed from adjacent Pennsylvania. There are, however, virtually no comparable studies from Pennsylvania other than those currently being conducted in other portions of eastern Pennsylvania by the second author (JCL) which have shown a similar lack of adequate basic lichen diversity data. Thus the dire need for intensive floristic surveys is not limited to the political boundaries of the DWGNRA, but rather extends throughout the commonwealth as a whole.

Despite the existence of a wealth of baseline data for Pennsylvania from the late 1700’s through the mid 1800’s (Lendemer & Hewitt 2002), there has been virtually no progress towards a comprehensive understanding of the lichen flora of Pennsylvania until the work of the second author began several years ago. Such historical data are not available for many regions outside of Europe, and it is nothing short of astonishing that a region so close to the east coast megalopolis would have remained so poorly explored for such a long period of time. This contribution only supports the need to continue the series of reports by the second author and his collaborators; the diversity of lichens in Pennsylvania is far from being “well known” or adequately estimated and understood. The overall lack of such work throughout eastern North America should lead us to question the comparatively small value we heretofore have placed on basic

floristic and taxonomic studies of these diverse and dynamic organisms in our region. In conclusion, we quote from an essay we recommend be read by all funding agencies, written by Richard Korf, one of the elders of American mycology: "We *must* collect, collect, and collect."

ACKNOWLEDGEMENTS

We are indebted to Bill Olson for arranging the 30th A. Leroy Andrews for and the National Park Service for permission to collect in the Water Gap. We also thank the participants for their enthusiastic help testing (and adding) to our previous checklist. Also thanks to Bob Dirig and Stefan Ekman for reviewing the manuscript.

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APPENDIX

DESCRIPTION OF BACIDIA PHYLLOPSOROPSIS

Bacidia phyllopsoropsis R.C. Harris & Lendemer ***sp. nov.***

TYPE: Pennsylvania, Monroe County: Middle Smithfield Township, Delaware Water Gap National Recreation Area, Community Drive Wetlands, E of Community Drive, 0.6 mi NE of River Road, 41°04'43"N, 75°00'24"W, 215-145 m; extensive semi-calcareous rock outcrops in hemlock-dominated forest, 17 Sep 2005, *Buck 49265* (NY!, holotype; hb. Lendemer!, isotype).

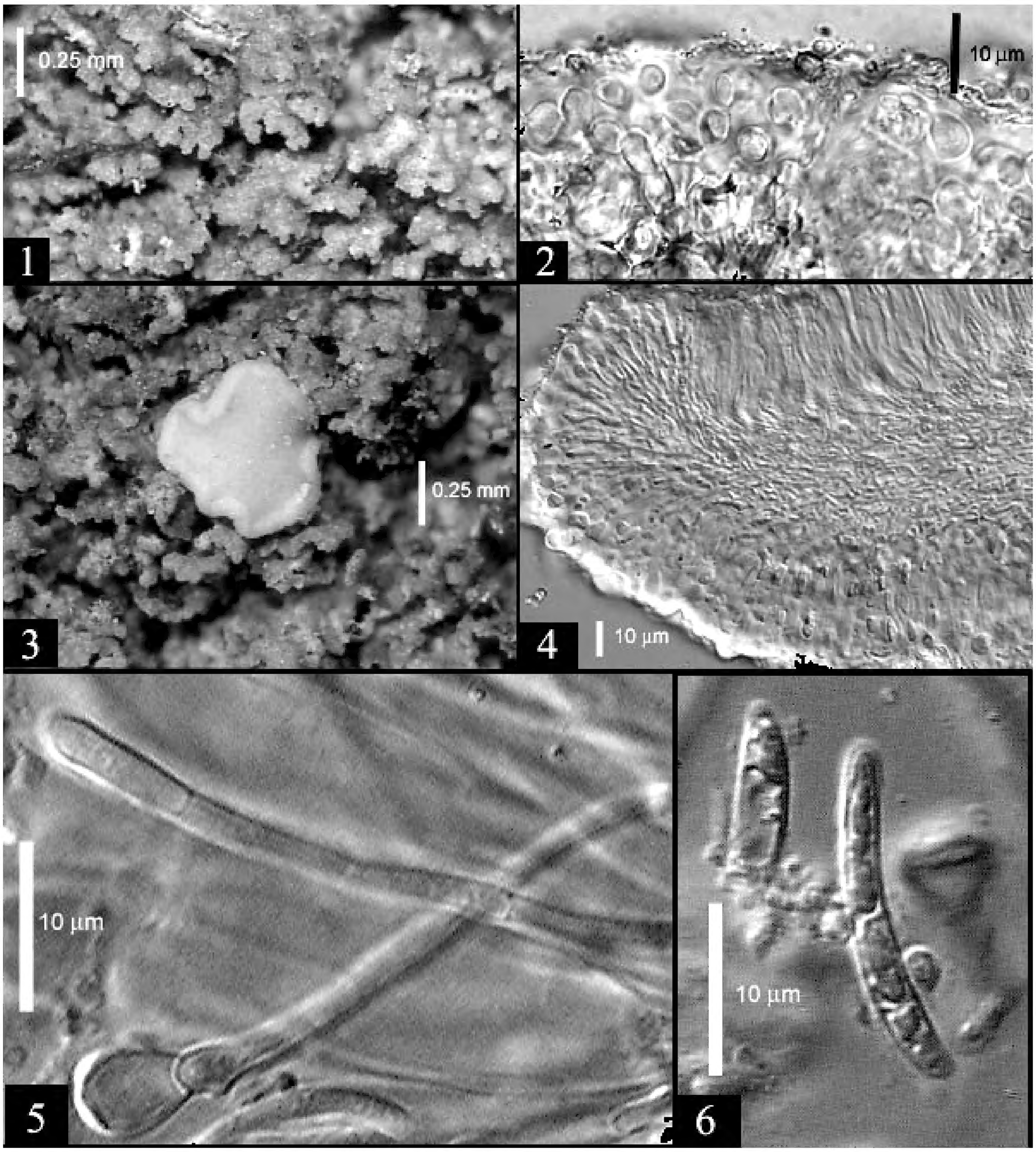
Thallus on moist, shaded, carbonate rock, squamulose, green to pale green, slightly shiny, tightly to loosely imbricate, ± flabellate, irregularly lobed, reaching 0.2-0.3 mm long, 0.3-0.4 mm wide, ca. 0.1 mm thick, corticate above, ecorticate below, with thin, whitish, weakly arachnoid prothallus; cortex paraplectenchymatous with thick cell walls, variable in thickness, 15-20 µm thick where well-developed, without crystals; KOH–, C–, PD–, no substances detected. Apothecia originating from hypothallus, initially sessile but soon surrounded and embedded by squamules, rounded when young with pale buff disk and whitish margin flush with disk, to 0.5 mm across, becoming irregular and convoluted with age, to 1.0 mm, disk darker in older apothecia of Pennsylvania collections (pale orangish to yellowish in New Jersey collection) apparently mainly due to presence in the hymenium of a brown hyphomycete, with the oldest apparently regenerating forming clusters of small apothecia, to 1.5 mm; no evident pigmentation in section (KOH–, N–); exciple of radiating hyphae ca. 45-60 µm thick, with cells enlarging outward, in center notably enlarged, and ± cylindrical; hypothecium prosoplectenchymatous, ca. 40-50 µm thick, with narrow

lumina and thick wall, K/I–; subhymenium ca. 40 µm thick, K/I+ blue; hymenium to 70 µm thick, K/I+ dark blue. Paraphyses little branched, some not expanded at tips, others with knob-like tip to 5µm in diameter. Asci subclavate, mostly with K/I– tholus but a few *Bacidia*-type seen, with eight spores. Spores acicular, 0-3-septate, 15-24 x 2.5-3 µm. Pycnidia not found.

We are not aware of any lichen in eastern North America similar to *B. phyllopsoropsis*. However, the generic position of this distinctive species is problematic. The squamulose thallus and whitish, arachnoid prothallus suggest *Phyllopsora* Müll. Arg. but apothecial anatomy and ascospores exclude it from that genus. It also seems excluded from the longer spored species segregated from *Phyllopsora* (*Bacidiopsora* Kalb, *Sporacestra* A. Massal., and *Squamacidia* Brako) by apothecial anatomy, prothallus color, lack of chemistry, etc. *Bacidina* Vězda is possible but the ascospores are rather broad for a *Bacidina*, the thallus does not produce goniocysts, and in the only squamulose species of *Bacidina* the squamules are ecorticate. The remaining choices seem to be *Bacidia* De Not. or a new genus. The path of least resistance has been taken. While the squamulose thallus is out of place in *Bacidia*, the apothecial anatomy of *B. phyllopsoropsis* seems close to that of *B. suffusa* (Fr.) A. Schneid. (Ekman, 1996, fig. 3C). Unfortunately pycnidia were not found since conidia are of considerable value in unraveling relationships in this group.

The new species was found growing on a vertical rock face in dense shade without associated lichens. The lack of associates seems to indicate that the species has developed a tolerance for shaded habitats where other lichens cannot grow. The shaded rock faces at the type locality are covered in many areas by species of *Lepraria* and *Phlyctis*. Similarly, the large shaded boulders at the type locality host abundant *Phaeophyscia adiastola* and *Trapelia placodioides* as well as *Verrucaria* and *Pseudosagedia* spp. It is interesting, considering the relative abundance of shade tolerant lichens, that *B. phyllopsoropsis* was found alone. It should also be recognized that the description of *B. phyllopsoropsis* brings the number of new species described from the Community Drive Wetlands to three, with a number of as yet unidentified collections possibly representing additional undescribed taxa.

Additional Specimens Examined. - U.S.A. NEW JERSEY. Warren Co., Frelinghuysen Township, Presbyterian Camp and Conference Center, ca. 1 mi SW of Johnsonburg on Co. Rd. 519, 40°58'N, 74°57'W, ca. 180 m, limestone outcropping in mixed hardwoods, 13 Sep 1992, *Buck 21604* (NY). PENNSYLVANIA. Monroe Co., [as for the type], *Buck 49278* (sterile), *Buck 49311* (NY).



Figs. 1-6 *Bacidia phyllopsoropsis* (holotype). Fig. 1: Squamulose thallus. Fig. 2: Cross-section of squamule. Fig. 3: Apothecium. Fig. 4: Cross-section of apothecium. Fig. 5: Paraphyses. Fig. 6: Ascospore. (figs. 4-6 differential interference contrast).

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